PLATYGASTERID PARASITOIDS IN RICE AND VEGETABLES

By
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THESIS

Submitted in partial fulfilment of the requirement for the degree of

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DECLARATION

I hereby declare that this thesis entitled **"Platygasterid parasitoids in rice and vegetables"** is a bonafide record of research work done by me during the course of research and that this thesis has not previously formed the basis for the award to me of any degree, diploma, associateship, fellowship or other similar title of any other University or Society.

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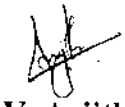

P.V. Arjitha

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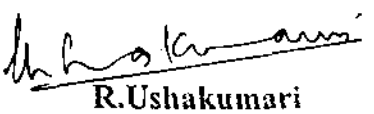
Certified that this thesis, entitled **"Platygasterid parasitoids in rice and vegetables"** is a record of research work done independently by **Miss.P.V.Arjitha** under my guidance and supervision and that it has not previously formed the basis for the award of any degree, fellowship or associateship to her.



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Dedicated

to my

Loving Parents

Introduction

INTRODUCTION

Biological control involves the purposeful utilisation of natural enemy components so as to reduce the pest populations. Natural enemies include parasitoids, predators and pathogens, of which parasitoids have got an important role. The greatest diversity of parasitoids is found in the order Hymenoptera. In classical biological control programme, 393 species of parasitoids were listed, of which 344 species are found to be hymenopterans (Greathead, 1986).

Platygasterid parasitoids are classified under the family Platygasteridae of the order Hymenoptera. Masner and Huggert (1989) recognized two subfamilies of Platygasteridae namely Sceliotrachelinae and Platygasterinae. Sceliotrachelinae comprises about 25 genera and Platygasterinae about 15 genera all around the world. Vlug (1995) published a catalogue of Platygasteridae of the world in which he mentioned 1090 species under 79 genera. Out of these only 44 species representing 15 genera are reported from India. Members of Sceliotrachelinae are found parasitising eggs of various insects such as Curculionidae and Cerambycidae (Coleoptera), Flattidae, Pseudococcidae and Aleyrodidae (Hemiptera). Platygasterinae members are closely associated with the cecidomyiid galls.

Adult platygasterids occur in most habitats. They are very minute (1-2 mm in size), black coloured wasps. Antennae usually have 10 segments, which are inserted close to the clypeus, fore wings are without distinct venation and in some cases the submarginal vein (subcosta) when present reaches only rarely the margin of the wing, trochanter two segmented and fore tibial spur is always trifid. In most species the scutellum is usually semi-circular or conical or with an apical spine. Females of this family have almost six apparent tergites (abdominal) or less than six tergites (Narendran, 2001).

In India, many workers reported *Platygaster oryzae* Cameron or *Platygaster* sp. as principal natural enemy of the rice gall fly *Orseolia oryzae* (Wood-Mason). In vegetables, there are reports on the platygasterid coming under the genus

Amitus and *Misocyclops*. Ushakumari (2002) studied the alpha taxonomy of 38 species of platygasterid parasitoids from Kerala.

There are reports on seasonal fluctuation and the extent of parasitism by platygasterid parasitoids from India. A study conducted by Ramaiah (1970) in Nizamabad district of Andra Pradash showed that the parasitoid *P. oryzae* was active from July to December in the rice crop. The per cent parasitism by this parasitoid was found to be 66.7, 78.01 and 85 per cent in September, October and November respectively. Mo *et al.* (1985) reported that the rate of parasitism by *P. oryzae* was in the range of 3.6 to 54.6 per cent.

Studies on the varietal reaction of platygasterid parasitoids of the rice gall fly in India are meagre. Moreover, no reports are available on seasonal fluctuation, per cent parasitism and varietal reaction of platygasterid parasitoids from Kerala. Hence the present investigation has been undertaken with the following four major objectives:

1. Study the species diversity of platygasterid parasitoids in rice and vegetables,
2. Study the morphology and morphometrics of the platygasterid parasitoids,
3. Study the seasonal fluctuation and per cent parasitism by platygasterid parasitoids in rice,
4. Study the varietal reaction of platygasterid parasitoids in rice.

Review of Literature

2. REVIEW OF LITERATURE

The platygasterid parasitoids are classified under the family Platygasteridae of order Hymenoptera. They are mainly parasitic on gall forming cecidomyiids, whiteflies and mealy bugs. The relevant literature regarding the taxonomy, species diversity, morphology and morphometrics, seasonal fluctuation, per cent parasitism and varietal reactions are reviewed here.

2.1 TAXONOMY

The first description of a platygasterid was made by Schrank (1781). Foerster (1856) erected the family Platygasteridae. Formerly Platygasteridae was treated as a family under the superfamily Proctotrupoidea. Muesebeck (1979) recognized Platygasteridae as a family with three subfamilies viz., Inostemmatinae, Sceliotrachelinae and Platygasterinae.

Masner and Huggert (1989) reassigned the genera of subfamily Inostemmatinae to the subfamily Platygasterinae or Sceliotrachelinae. In this, 41 genera are treated, of which 15 are classified in the subfamily Platygasterinae and 25 are classified in the subfamily Sceliotrachelinae. Masner (1993) separated the superfamily Platygastroidea from Proctotrupoidea. Ushakumari (2002) studied the alpha systematics of 38 species of Platygasteridae from Kerala.

2.2 SPECIES DIVERSITY OF PLATYGASTERID PARASITOIDS

In the catalogue on Platygasteridae, Haliday (1833) has listed out 1066 species of which, 987 have been recognized as valid and 123 genera, of which 82 are valid. Curtis (1837) published a list of 115 species of Platygasteridae of Great Britain and Ireland. The world fauna known at that time was about 140 described species. The "Catalogues Hymenoptera Europe" (Kirchner, 1867) listed 159 species, slightly fewer than were actually known at that time. Marshall (1873) published a catalogue of British Hymenoptera in which only 111 species were listed. Torre (1898) published his well known catalogue of Hymenoptera of the world and listed 375 species of Platygasteridae.

Mani (1975) reported eight new species of Platygasteridae from India viz., *Inostemma berijama, Sacepalus indicus, Trichacis khajjiara, Isocybus indicus, Platygaster panchaganii* and *Platygaster satara.* An annotated list of 33 species of platygasterids from Finland is given by Koponen and Huggert (1982). Vlug (1995) published a catalogue of Platygasteridae of the world in which he mentioned 1090 species under 79 genera, out of these only 44 species representing 15 genera are from India.

Amendt (1997) recorded 10 species of Platygasteridae from eight selected gall midges (Cecidomyiidae) on *Salix* sp. According to Narendran (2001), the family Platygasteridae contain approximately 1200 species so far known in the world. Ushakumari (2002) studied 38 species of Platygasteridae under eight genera from Kerala.

2.2.1 In rice

Hidaka *et al.* (1978), Kobayashi and Kadkao (1978) reported the occurrence of *P. oryzae* from *O. oryzae* in Thailand. Grover and Prasad (1980) observed *P. oryzae* as the principal natural enemy of *O. oryzae*. Chiu (1980) reported a polyembryonic and monoembryonic species of *Platygaster* in China where the polyembryonic species is the predominant species. Two species of *Platygaster* (one a gregarious and the other a solitary endoparasite) were reported from rice gall midge, *O. oryzae* in Kwangtung Province, China by Liu *et al.* (1981).

Joshi *et al.* (1984a) reported a brown species of *Platygaster* which was distinct from *P. oryzae*. The biological characteristics of *P. oryzae* and *P. foersteri* Gahan were studied by Kobayashi and Kadkao (1984) in Thailand. Chandrakar *et al.* (1989) identified the platygasterid *P. oryzae* as parasitoid of the cecidomyiid, *O. oryzae*. Five hymenopterous parasitoids viz., *Eurytoma* sp.; *Neanastatus grallarius* (Masi), *Obtusiclava oryzae*, *P. oryzae* and *P. foersteri* were reported on ratoon rice plants in paddy fields in Sri Lanka (Kobayashi *et al.*, 1991). Another study was conducted on the seasonal dynamics of *P. oryzae* and *Platygaster* sp. in rice at Rajendranagar, Hyderabad by Sain and Kalode (1992).

The African rice gall midge, *O. oryzivora* Harris and Gagne, was found to be parasitised by *P. diplosisae* and *Aprostocetus pachydiplosisae* in Nigeria (Umeh and Joshi, 1992; Ukwungwu and Joshi, 1992). The rice gall midge, *O. oryzae,* is attacked by about half a dozen parasitoids including *P. oryzae* and *Anastatus* sp. The egg-larval parasitoid *P. oryzae* is the key parasitoid of gall midge (ICAR, 1994). Kobayashi and Kudagamage (1994) reported the parasitoids *P. oryzae* and *P. foersteri* in paddy fields of Sri Lanka. Nacro *et al.* (1995) observed *P. diplosisae* as parasitoid of *O. oryzae* in irrigated rice fields at Karfiguela, Burkina Faso.

Parasitism by *P. oryzae* in rice fields of Rice Research Station, Moncompu and farmer's fields of Kuttanadu was observed by Ambikadevi (1998). Beevi *et al.* (2000) conducted a survey in Thrissur district to study the abundance and diversity of hymenopteran parasitoids in rice ecosystem and reported the presence of *Platygaster* sp. in the field.

2.2.2 In vegetables

Ayyar (1963) reported parasitism by a platygasterid *Misocyclops* sp. on cucurbit stem gall fly *Lasioptera falcata* F. Gerling (1990) studied the life history of *Amitus hesperidium* Silvestri which develop gregariously in whiteflies. A platygasterid parasitoid *Aleyroctonus* was reported from whiteflies in Australia by Carver and Reid (1996). Viggiani (1997) discovered the male of *Amitus fuscipennis* (Hymenoptera: Platygasteridae), a parasitoid of the greenhouse white fly *Trialeurodes vaporariorum* West wood. Kajita (2000) conducted a study to find the geographical distribution and species composition of parasitoids (Hymenoptera: Chalcidoidea) of *Trialeurodes vaporariorum* and *Bemisia tabaci* complex (Homoptera: Aleyrodidae) in Japan and found the platygasterid parasitoid *Amitus* sp. parasitising them.

2.3 MORPHOLOGY AND MORPHOMETRICS

Mani (1975) gave the morphology and morphometrics of eight new species of Platygasteridae. Mukerjee (1978) described 15 species of Platygasteridae. Yamagishi (1980) described and illustrated five species of *Platygaster*, parasitic on

willow gall midge in Japan. Fourty new species of Proctotrupoidea from India were described by Mukerjee (1981) which include *Fidiobia* Ashmead, *Platygastoides* Dodd and *Isostasius* Foerster of Platygasteridae. Ushakumari (2002) studied the morphology and morphometrics of 38 species of Platygasteridae of Kerala under eight genera. Out of these, 12 species were *Platygaster*.

2.3.1 Diagnostic characters of the family Platygasteridae

Adults are minute, usually 1-2 mm in length and mostly black in colour. Antennae usually have 10 segments. Antennae are inserted close to clypeus. Scape is often enlarged. Fore wings are without distinct venation and in some cases the submarginal vein (subcosta) when present reaches only rarely the margin of the wing. Trochanter two segmented and fore tibial spur always trifid. In most species scutellum is usually semicircular or conical or with an apical spine. Females of this family have almost six apparent tergites (abdominal) or less than six tergites. The apical (seventh) abdominal tergite is mostly hidden under sixth tergite (Narendran, 2001).

2.3.2 Diagonistic characters of the subfamily Platygasterinae

Mostly slender to very elongate species. In females, the antennal club is cylindrical and has four or five clavomeres, with the clavomeres clearly separated; in males the flagellum is usually thread like. The fore wing is with a short submarginal vein or is absent. The laterotergites are usually narrow and tightly appressed against the sternites, making the metasoma more compact (Masner, 1993).

2.4 SEASONAL FLUCTUATION AND PARASITISM

2.4.1 In abroad

Hidaka *et al.* (1978) reported that the total parasitism by *P. oryzae* and *Neanastatus grallarius* ranged between 11 to 35 per cent. Studies were conducted in Kwangtung Province, China on the biology of parasitoids attacking *O. oryzae* (Liu *et al.*, 1981). A total of five species of parasitoids were observed viz., two species of

Platygaster, N. grallarius, N. oryzae Ferriere and *Obtusiclava oryzae* Subba Rao. The total parasitism observed was as high as 90 per cent in the late crop.

Galls produced by *O. oryzae* were collected from rice at 18 sampling sites in five districts in the wet zone and three sites in the intermediate zone of paddy fields in Sri Lanka, between 14th June and 5th July 1989 when the plants were in the vegetative growth stage. Parasitoids and predators were recorded in the laboratory up to the adult stage. Galls containing *P. oryzae* were found most frequently (13.5 per cent of galls), followed by *N. cinctiventris* (8.7 per cent) (Kobayashi *et al.*, 1990).

The seasonal occurrence of immature stages of the cecidomyiid, *O. oryzae* was investigated in the rice fields in Northern Thailand in 1973-75 and life tables were constructed for evaluating the impact of two egg larval parasitoids *P. oryzae* and *P. foersteri* on its populations. *O. oryzae* completed two generations in a year when the eggs of the first generation were deposited before mid August. *P. oryzae* showed density dependent response to the host population, while *P. foersteri* responded only slightly to an increase in host density. *P. oryzae* contributed to the mortality of *O. oryzae* in 1974 when the rate of parasitism was high (65 per cent), but parasitism by *P. foersteri* was too low to influence host population density (Kobayashi and Kadkao, 1989). Another investigation in the rice fields of Thailand in 1975-76 by Kadkao (1991) showed that the parasitoids *P. oryzae* and *P. foersteri* passed through the dry season as eggs in the body cavity of first instar larvae of *O. oryzae*. Both parasitoids developed into pupae in mid March to late April and it is suggested that the adults might emerge in order to synchronize with the ovipositional period of the first generation of *O. oryzae*. About 90 per cent of the parasitoids in host larvae died between early December and late April.

Hymenopterous parasitoid species and their parasitism were investigated in ratoon rice plants in paddy fields in the period of early to middle October, 1990, immediately before the maha rainy season in Sri Lanka. *P. oryzae* and *N. cinctiventris* were the most abundant among these species. The highest per cent parasitism by *P. oryzae*, was recorded as 68.2 per cent and by *N. cinctiventris* it was 52.1 per cent. It

is concluded that, these parasitoids pass through the season, even though the rice plants are not cultivated, mainly in the galls on secondary tillers which sprout from rice stubbles (Kobayashi *et al.*, 1991).

Umeh and Joshi (1992) reported that the maximum parasitism by *P. diplosisae* and *Aprostocetus pachydiplosisae* in the African rice gall midge in South Nigeria reached up to 72 per cent and 42 per cent respectively and in the late season combined parasitism reached 98 per cent.

Kobayashi and Kudagamage (1994) studied the hymenopteran parasitoids and its parasitism in paddy fields of 11 districts in Sri Lanka including three districts in the dry zone, during the maha monsoon season (December 1991 to mid January 1992), yala monsoon season in 1989 and the dry season just before the maha monsoon in 1990. Among the parasitoids observed *P. oryzae* was widely distributed through out all the climatic zones, with the mean value of 21 per cent parasitism. Mean parasitism by *P. foersteri* was only one per cent. Parasitism by these two species decreased from the wet zone to the dry zone. Parasitism by *P. oryzae* being about 31, 20 and three per cent in the wet, intermediate and dry zones respectively.

Nacro *et al.* (1995) reported *P. displosisae* and *A. procerae* as parasitoids of *O. oryzae* in irrigated rice fields at Karfiguela, Burkina Faso during 1992-93. Insect population in the wet season developed through three phases; initial slow increase, followed by rapid increase coinciding with maximum tillering and a declining phase. The greatest midge population and highest levels of parasitism developed in late plantings. Midge infestation was low and no parasitoids detected during the dry season.

2.4.2 In India

A study conducted by Ramaiah (1970) in Nizamabad district of Andhra Pradesh showed that, the parasitoid *P. oryzae* was active from July to December in rice. Per cent parasitism by this parasitoid was found to be 66.7, 78.01 and 85 in September, October and November respectively. Rai *et al.* (1976) reported *Platygaster*

sp. and *Neanastatus* sp. parasitised more than 50 per cent of the gall midge larvae in coastal Karnataka state. Chand (1981) conducted a study on rice gall midge in the summer crop at Ranchi and reported that in May 1981, parasitism by *Platygaster* was as high as 40 per cent, though the parasite normally appears late October in the wet season crop.

Rao *et al.* (1981) reported that the parasitism by *Platygaster* sp. reached as high as cent per cent in the second half of November and was associated with fluctuation in numbers of *O. oryzae*. Another study by Rao *et al.* (1983) showed that the parasitoids attacking eggs and larvae of *O. oryzae* reached cent per cent when the crop was 100 days old, the damage level at that time being less than one per cent. The main parasitoids were *Platygaster* sp., *Neanastatus* spp., *Eurytoma* spp., *Trichacis* spp. and *Leptacis* spp.

Shukla *et al.* (1983) found that in April-May 1977, parasitism by *P. oryzae* reached 14.3 per cent. He had also recorded *N. grallarius* from the pupa of *O. oryzae* collected from wet season rice crop from Madhya Pradesh in 1980. In ratoon rice, parasitism by *Platygaster* sp. was recorded as 37.8 per cent (Joshi *et al.*, 1984b). Potineni and Agarwal (1984) reported that *O. oryzae* attacking kharif rice crop in Raipur, Madhya Pradesh was heavily parasitised by *P. oryzae* and *N. grallarius*. Joshi *et al.* (1984a) reported that *Platygaster* was active from October 1981 to February 1982 with peak population of parasitoid being present in December. Maximum levels of parasitism on different rice varieties were 42.1 per cent.

Jena *et al.* (1985) observed abundance and parasitism by *P. oryzae* in the Jaya stubble and the wild rice *Oryza perennis* at Bhubaneswar, Orissa. He found that the pest was prevalent in the stubble through out the off season and the parasitism peaked from last week of January to second week of February. Wild rice showed low pest infestation and higher level of parasitism.

Mo *et al.* (1985) reported that the rate of parasitism by *P. oryzae* was in the range of 3.6 to 54.6 per cent. A study conducted on seasonal incidence of rice gall

midge and its natural enemies in Madhya Pradesh showed that, rate of parasitism by the parasitoids *P. oryzae* and *N. grallarius* (*N. cinctiventris*) were 33.8 per cent (Shrivastava *et al*., 1987).

The relationship between the rice gall midge and its parasitoids *P. oryzae* and *N. grallarius* during the wet season in Madhya Pradesh was studied by Bhardwaj *et al.* (1988). He found that the rate of parasitism by *P. oryzae* was greater (30 per cent) than by *N. grallarius* (21 per cent). A study conducted during 1986-87 in Orissa showed that the parasitism by *Platygaster* sp. ranged from 2.32 per cent to 13.55 per cent and the parasitoid was not found during February and July-August (Mathur *et al.*, 1988).

Chandrakar *et al.* (1989) observed that *P. oryzae* became active in the second week of September when gall fly infestation was lowest (5.5 per cent), 25-30 days after transplanting. The peak level of parasitoid activity occurred during the first week of December resulting in heavy mortality (85 per cent) during this month. The level of infestation by *O. oryzae* and the level of parasitism by *P. oryzae* were positively correlated during the second week of September and the first week of November and the reverse trend was observed from then until the end of December.

A study carried out on the population dynamics of rice pest, *O. oryzae* and its parasitoid at Rajendranagar (Andhra Pradesh) showed that the pest appeared in late August, its incidence reaching a peak in October followed by a decline by December. The activity of its parasitoids closely followed that of the host, increasing slowly to reach a peak in October-November. However, parasitism declined more slowly than host activity. Average parasitism between September and December was highest (45.1 per cent) in 1985 and lowest (34.6 per cent) in 1982 (Sain and Kalode, 1992). In a report of ICAR (1994), it is stated that the parasitism by *P. oryzae* was 93.9 per cent at Cuttack.

2.4.3 In Kerala

Beevi *et al.* (2000) reported that the platygasterid parasitoids were most abundant in rice during the rabi season.

2.5 OTHER HYMENOPTERAN PARASITOIDS

Hummelen and Soenarjo (1977) reported six species of parasitoids of *O. oryzae* viz. *P. oryzae, Obtusiclava oryzae* and *N. oryzae, Eurytoma setitibia* Gah, *Trichopria* sp. and a species of *Tetrastichus.* Patnaik and Satpathy (1984) reported that the pupal parasite *N. grallarius* often behaved as a facultative hyper parasite of *P. oryzae.* Das *et al*. (1987) reported the natural enemies of rice and grass gall midges from Orissa and the hymenopteran parasitoids include *P. oryzae* (Platygasteridae), *Neanastatus* spp. (Eupelmidae), *Propricroscytus mirificus* (Pteromalidae), *Eurytoma* and *Tetramera* sp. (Eurytomidae). Mathur *et al.* (1989) reported *E. setitibia* and two other species of *Eurytoma* from *O. oryzae.* According to Dey *et al.* (1999), *N. cinctiventris* is the synonym of *N. grallarius.*

2.6 VARIETAL REACTION

Hidaka *et al.* (1978) reported the occurrence of parasitoids *N. grallarius* and *P. oryzae* in high yielding hybrid variety RD in the central rice growing area of Thailand. The dominant parasitoid was *N. grallarius* and the total parasitism by the two parasitoids ranged 11-35 per cent. Joshi *et al.* (1984a) conducted studies for evaluating the influence of rice varieties on the extent of parasitism by the platygasterid parasitoids on gall midge, *O. oryzae.* Maximum levels of parasitism on different rice varieties were 42.1 per cent on IR 20, 40.8 per cent on Bhavani, 43.2 per cent on ADT 31, 26.9 per cent on CO 42 and 20.1 per cent on Jaya. The parasitoids *P. diplosisae* and *A. procerae* were observed in cv. ITA 123 in irrigated rice fields at Karfiguela, Burkina Faso (Nacro *et al.*, 1995). Katti *et al.* (2000) observed the presence of *P. oryzae* in rice cv. BPT-5204 in farmer's fields in Andhra Pradesh, India.

The influence of gall midge (*O. oryzae*) resistance in rice on the parasitic activity of the gall midge parasitoid *P. oryzae* was studied in 1987 (Muthuswami *et al.*, 1989). Gall midge incidence was recorded in 20 varieties with different levels of gall midge resistance. RP 1579-4-6-1 had 1.8 per cent gall midge incidence and cent per cent parasitisation, while TNAU 831520 had 81.5 per cent gall midge incidence

and only nine per cent parasitisation. In general, adult *P. oryzae* emergence from galls was low in resistant varieties.

Four rice cultivars showing different levels of resistance to the African rice gall midge (*O. oryzivora*), namely, ITA 306 (succeptible), Cisadane (tolerant), NHTA 8 (partially resistant) and Eguazankpa (a widely grown traditional cultivar) were evaluated in a field experiment conducted in South East Nigeria in 1998 to determine whether the variability in resistance influenced the parasitism of *P. diplosisae* and *A. procerae* (Nwilene *et al.*, 2000). The experiment proved that there was no significant difference in the number of larvae per host pupae parasitised and the degree of parasitism by both parasitoids was consistently higher in the four cultivars, irrespective of the variation in the level of resistance.

Materials and Methods

3. MATERIALS AND METHODS

The research work entitled "Platygasterid parasitoids in rice and vegetables" comprise the following aspects:

1. Field collections of platygasterid parasitoids from rice and vegetable crops,
2. Studies on morphology, morphometrics and identification of platygasterid parasitoids collected,
3. Estimating the seasonal fluctuations of platygasterid parasitoids in rice,
4. Per cent parasitism and
5. Varietal reaction of the platygasterid parasitoids in rice.

3.1 SURVEY

Surveys were conducted in the rice fields of Ollukkara and Madakkathara panchayats of Thrissur District. Three locations from each panchayat were selected at random for the collection of platygasterid parasitoids.

3.2 COLLECTION

3.2.1 By net sweeping

The platygasterid parasitoids were collected from the rice fields using sweep nets. Collections were made from the three locations, selected at Madakkathara and Ollukkara panchayats. Sweeping was done at weekly intervals starting from the transplanted stage to the late tillering stage. Each location comprised of 10 cents. Five sweeps were made, four from the corners and one from the centre. Collections were done during the 'virippu' (April-May to September-October) and 'mundakan' (September-October to December January) seasons.

The collected parasitoids were then transferred to killing bottle in which ethyl acetate was provided inside the cartridge in the lid. The count of the platygasterids and other hymenopteran parasitoids were recorded for estimating the seasonal fluctuation.

3.2.2 By rearing

Rice galls were collected from the selected locations of Ollukkara and Madakkathara panchayats at weekly intervals. The galls were kept in small glass vials of size 5 cm x 2 cm and covered with cotton plugs. Rearing of parasitoids from galls was conducted during 'virippu' and 'mundakan' seasons. The vials were examined daily for the emergence of platygasterid parasitoids, until the emergence abated. The emerged out parasitoids were collected by aspirators, killed and preserved.

The cecidomyiid galls collected from bittergourd and Coccinea (*Lasioptera falcata*) were kept in small plastic bottles of size 8.5 cm x 5.5 cm. The mouth of the bottle was covered using muslin cloth and held in position by rubber bands. The mealy bugs (*Centrococcus insolitus*) and whiteflies (*Aleurodicus dispersus*) from different vegetable crops namely, brinjal, tomato and chilli were collected along with the plant materials and kept in glass jars of size 20 x 10 cm. Moistened cotton was placed at the cut end of the plant material. The mouth of the jars were then covered with muslin cloth. Daily observations were done for the emergence of the parasitoids in both cases.

3.3 PRESERVATION

3.3.1 By card mounting

For mounting the specimen, the procedure given by Narendran (2001) was followed. The specimen was mounted on the card tilted slightly on its side of about 45° to the plane of the card in such a way that the face and mandibles are clearly visible.

For mounting, the specimen was placed on filter paper (adsorbent piece of card) with few drops of alcohol. The wings, legs and antennae were then correctly positioned by using a wet brush. Using a fine pointed pin a tiny drop of ordinary glue (approximately 2/3rd the volume of mesosoma of the specimen) was put on the card. Then a fine brush was moistened with a little alcohol and the specimen was picked up by touching the brush at the mesopleural region. It was then positioned with the mid point of the mesosoma on the glue with the body lying length wise. The specimen was pressed gently and firmly with the brush for good adhesion.

The specimens thus mounted were held on entomological pins (Asta Insect Pins No.3, 38 mm x 0.53 mm made by Navy Goodman and Co., England), labelled and kept in insect boxes. Naphthalene balls were kept in the boxes to protect it from insect attack.

3.3.2 Unmounted materials

The unmounted materials were stored in 70 per cent alcohol in small screw vials which were kept in refrigerator. The bottles were properly numbered and labelled.

3.4 LABELLING

After mounting the specimens, permanent small rectangular labels were given which contain the information such as name of the country (in capital letters), name of the state, name of collection locality, name of the collector, date of collection, name of hosts and collection number.

3.5 IDENTIFICATION OF THE MATERIAL

The collected specimens were identified by running through the key to the species of *Platygaster*, developed by Ushakumari (2002). The identity was confirmed after comparing with the original description and illustration in the literature.

For sorting and mounting, the stereoscopic Binocular Microscope Olympus was used. The illustrations of the specimen were made by the Camera Lucida attachment of wild M_3Z Stereoscopic Binocular microscope. The figures thus obtained were enlarged. The scale of magnifications are indicated near the illustrations.

3.6 MORPHOLOGY AND MORPHOMETRICS

The morphological characters of the parasitoids collected were studied by using the wild M_3Z stereo microscope. The illustrations of the dorsal and lateral view of the parasitoids were drawn by using the camera lucida attachment. The following morphological and morphometric characters were observed for the identification of

the parasitoid viz., length, body colour, body pubescence, colour of compound eyes and ocelli, presence of punctures on the head, colour of antenna, number of segments and number of club forming segments of antenna, colour of mandible, presence and absence of notauli, scutellum characters, proportionate length of body with antenna, length and width of antennal segments, thorax and abdomen, presence and absence of submarginal veins, length and width of wings, marginal hairs, colour of leg, tibial spination and punctures of abdominal segments.

3.7 SEASONAL FLUCTUATION

The counts of platygasterid parasitoids collected from the three locations each of Ollukkara and Madakkathara panchayats were noted at weekly intervals (As in section 3.2.1). The observation was made during 'virippu' and 'mundakan' seasons from the transplanted stage to the late tillering stage of the crop.

3.8 PER CENT PARASITISM

Rice galls collected from the three locations each from Ollukkara and Madakkathara panchayats were kept in small vials, for the emergence of parasitoids. Galls were collected at weekly intervals from the transplanted stage to the end of the late tillering stage of the crop during 'virippu' and 'mundakan' seasons. From each location the maximum possible number of galls were collected. The number of parasitaised galls were recorded for determining the per cent parasitism.

$$\text{Per cent parasitism} = \frac{\text{No. of parasitised galls}}{\text{No. of galls collected}} \times 100$$

3.9 VARIETAL REACTION

The observation on this study was made at Regional Agricultural Research Station, Pattambi. The germplasm varieties were raised observing all the package of practices recommendations including the plant protection measures. In 'mundakan' 2002, 180 accessions and in 'virippu' 2003, 50 accessions were observed (Table 6 and 7). The size of the plot is 5.6 m^2 and the entire area was selected. The occurrence of

gall fly and the platygasterid parasitoids were determined by net sweeping in the field and also by *in situ* collections of entire number of galls. The study was conducted at the active tillering stage of the crop belonging to each germplasm accessions. Observations were made during the 'virippu' and 'mundakan' seasons.

3.10 STATISTICAL ANALYSIS

The data obtained were analysed for seasonal and varietal comparison. The test of significance was done using paired t-test (Panse and Sukhatme, 1985).

Results

4. RESULTS

The results obtained on the species diversity, seasonal fluctuation, per cent parasitism and varietal reactions of platygasterid parasitoids in rice and vegetables are presented in this chapter.

4.1 SPECIES DIVERSITY

The parasitoids obtained from the survey were identified by running through the key to the species of *Platygaster*.

4.1.1 In rice

Six species of *Platygaster* were obtained from the net sweep. They include *P. coorgensis* (Mukerjee), *P. inderdaadi* (Mukerjee), *P. malabaricus* (Mukerjee), *P. minimus* (Mukerjee), *P. oryzae* Cameron and *P. sasii* Ushakumari. Out of these six species, only *P. coorgensis, P. minimus, P. oryzae* and *P. sasii* were obtained from rearing the galls. The first three species are gregarious and the last one is solitary.

4.1.2 In vegetables

The Bittergourd and Coccinea galls as well as mealy bugs and whiteflies collected from different vegetable crops were kept under confinement. The platygasterid parasitoids were not found to emerge from the galls and the other host.

4.2 MORPHOLOGY AND MORPHOMETRICS

4.2.1 *P. coorgensis* (Fig. 1)

Anopedias coorgensis Mukerjee, 1978. *Mem. Sch. Ent.*, 5: 67-98

Length 1.13 mm; body black; mandible brown; compound eyes and ocelli silvery grey; tegula black; all legs except last tarsal segments brown, last tarsal segment black; wings sub-hyaline with pilosity brown; body pubescence white.

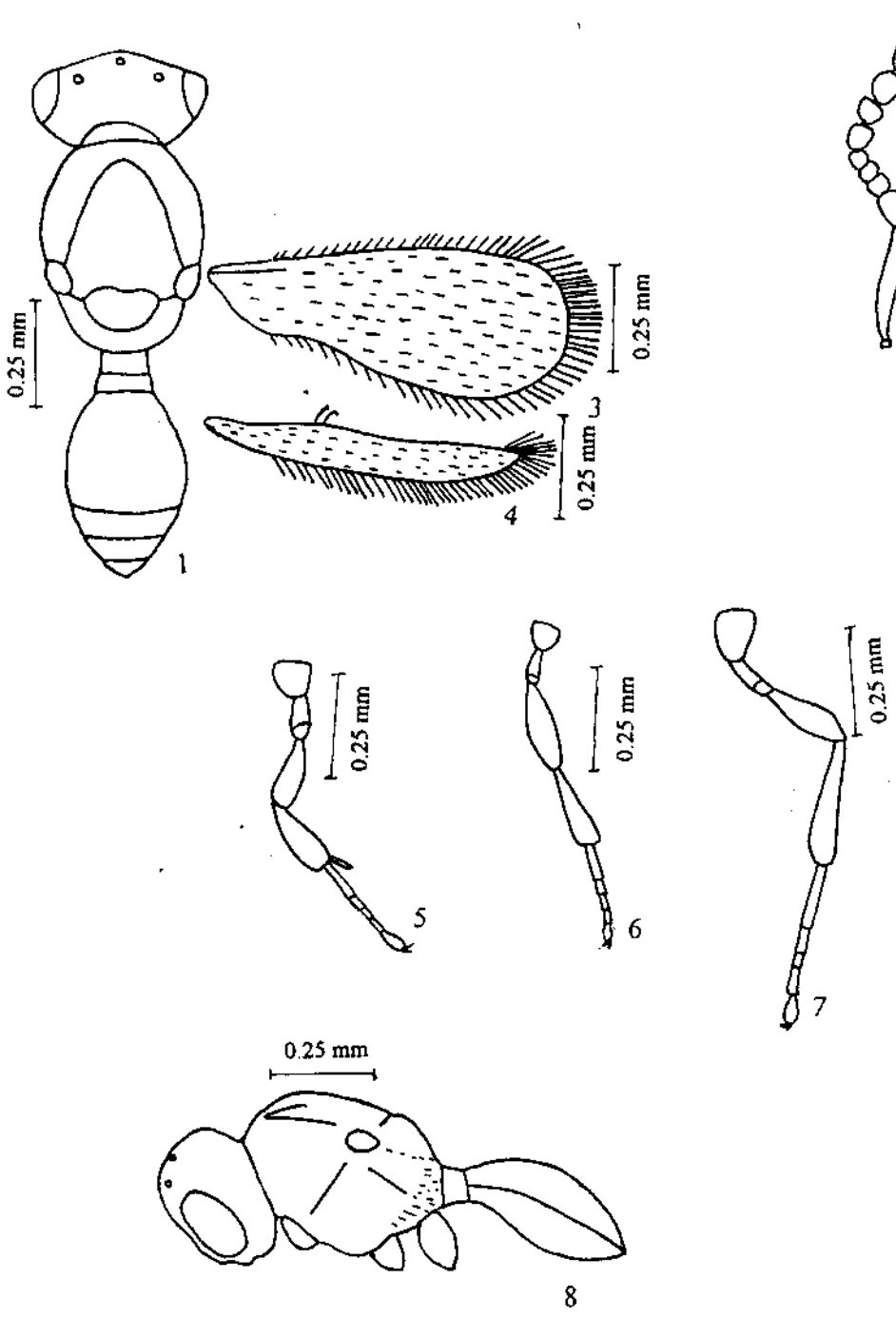


Fig. 1. *P. coorgensis* (Mukerjee)

1. Dorsal view
2. Antenna
3. Forewing
4. Hind wing
5. 1st pair of leg
6. 2nd pair of leg
7. 3rd pair of leg
8. Lateral view

Head: Frons reticulate and vertex with fine punctures, shiny without pubescence; antennal socket close to clypeal border; head width in dorsal view 2.6x its median length; scrobe and inter antennal projection indistinct; occipital carina distinct; head wider than mesosoma in dorsal view; antenna 10 segmented; relative length of antenna:body 52:35; relative length:width of antennal segments: Scape - 16:3; pedicel - 5:3, F_1 - 2:3; F_2 - 2:3; F_3 - 3:3; F_4 - 4:3; F_5 - 3:4; F_6 - 5:4; F_7 - 5:4; F_8 - 6:3.

Mesosoma: Smooth, sparsely hairy; notauli absent; mesoscutum width 1.67x its length; propodeum without longitudinal carina; pro and meso pleura smooth, shiny and convex; metapleuron hairy; fore wing length 2.5x its maximum width; submarginal vein present; marginal fringe short, apical fringe moderate; hind coxal length 1.36x its maximum width; hind femur 1.86x length of trochanter, about 3.25x its own maximum width; hind tibial length 1.8x length of metatarsus, distinctly shorter than combined length of hind tarsal segments.

Metasoma: Petiole transverse, 1.42x wider than its length; tergites with fine punctures; metasoma little longer than mesosoma, but distinctly shorter than length of head and mesosoma combined; about 1.8x longer than wide in dorsal view.

4.2.2 *P. inderdaadi* (Fig. 2)

Eritrissomerus indicus Mukerjee, 1978. *Mem. Sch. Ent.*, 5: 78-80

Female: Length 1.21 mm, body black; mandible brown; compound eyes and ocelli silvery grey; tegula brown; metasoma black; body sutures more darker; all legs except last tarsal segment brown, last tarsal segment black; wings subhyaline with pilosity brown; body pubescence white.

Head: Frons smooth and vertex with fine punctures, shiny without pubescence; antennal sockets close to clypeal border; head width in dorsal view about 2x its median length; scrobe and interantennal projection indistinct; occipital carina distinct; head wider than mesosoma in dorsal view; antenna 10 segmented; relative length of antenna:body - 76:58; relative length:width of antennal segments; Scape - 21:4;

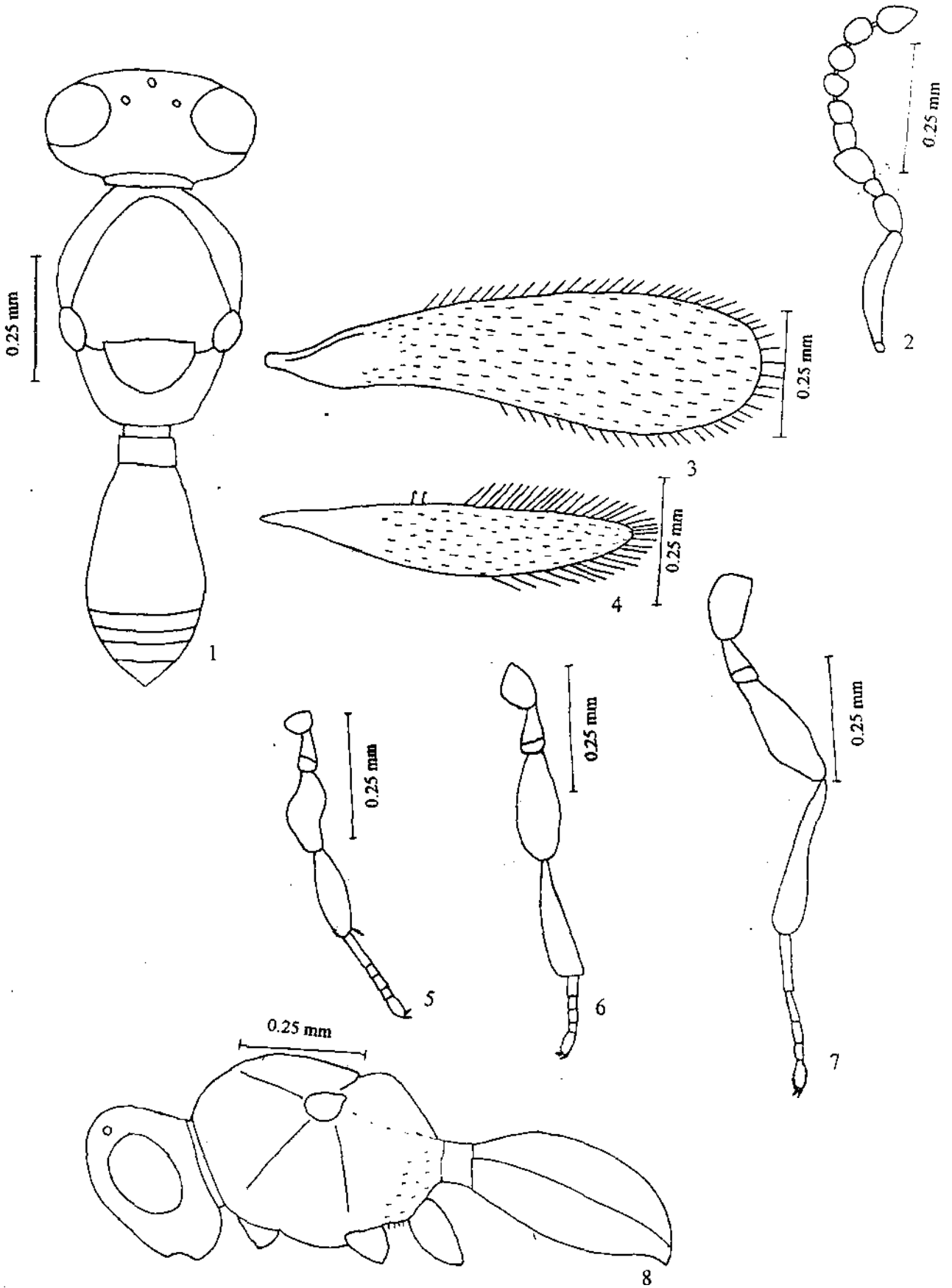


Fig. 2. *P. inderdaadi* (Mukerjee)

1. Dorsal view
2. Antenna
4. Hind wing
5. 1st pair of leg
7. 3rd pair of leg
8. Lateral view

pedicel - 7.5:5; F_1 - 4:3; F_2 - 8:6; F_3 - 5:4.5; F_4 - 4.5:4; F_5 - 4.5:4.5; F_6 - 5:5; F_7 - 5.5:5; F_8 - 8.5:5.

Mesosoma: Smooth, sparsely hairy; notauli absent; meso scutum width 1.7x its length; propodeum without longitudinal carina; pro and mesopleura smooth, shiny, mesopleuron more convex; meta pleueron hairy; fore wing length 3.52x its maximum width; submarginal vein short, straight, not touching the wing margin and without distal knob; marginal fringe and apical fringe moderate; hind coxal length 1.63x its maximum width; hind femur 2.67x length of trochanter, about 2.8x its own maximum width; hind tibial length 3x length of metatarsus, same length as that of combined length of hind tarsal segments.

Metasoma: Petiole transverse; 1.3x wide as its length; without longitudinal lines; tergites with fine punctures; meta soma little longer than mesosoma, but distinctly shorter than length of head and mesosoma combined; about 2.3x longer than wide in dorsal view.

4.2.3 *P. malabaricus* (Fig. 3)

Trichacis malabaricus Mukerjee, 1978. *Mem. Sch. Ent.* 5: 67-98

Female: Length 1.3 mm; body black; mandible brown; compound eyes and ocelli silvery grey; tegula brown; meta soma black; body sutures more darker; all legs except last tarsal segments brown, last tarsal segment black; wings subhyaline with pilosity brown; body pubescence white.

Head: Frons smooth and vertex without fine punctures, shiny without pubescence; antennal sockets close to clypeal border; scrobe and interantennal projection indistinct; occipital carina not distinct; head wider than mesosoma in dorsal view; antenna 10 segmented; relative length of antenna:body - 57:41; relative length:width of antennal segments: Scape - 2:3.5; pedicel - 4.5:2.5; F_1 - 2:2; F_2 - 3:2.5; F_3 - 2.5:3; F_4 - 4:4; F_5 - 4:4; F_6 - 5:5; F_7 - 5:5; F_8 - 6:4.

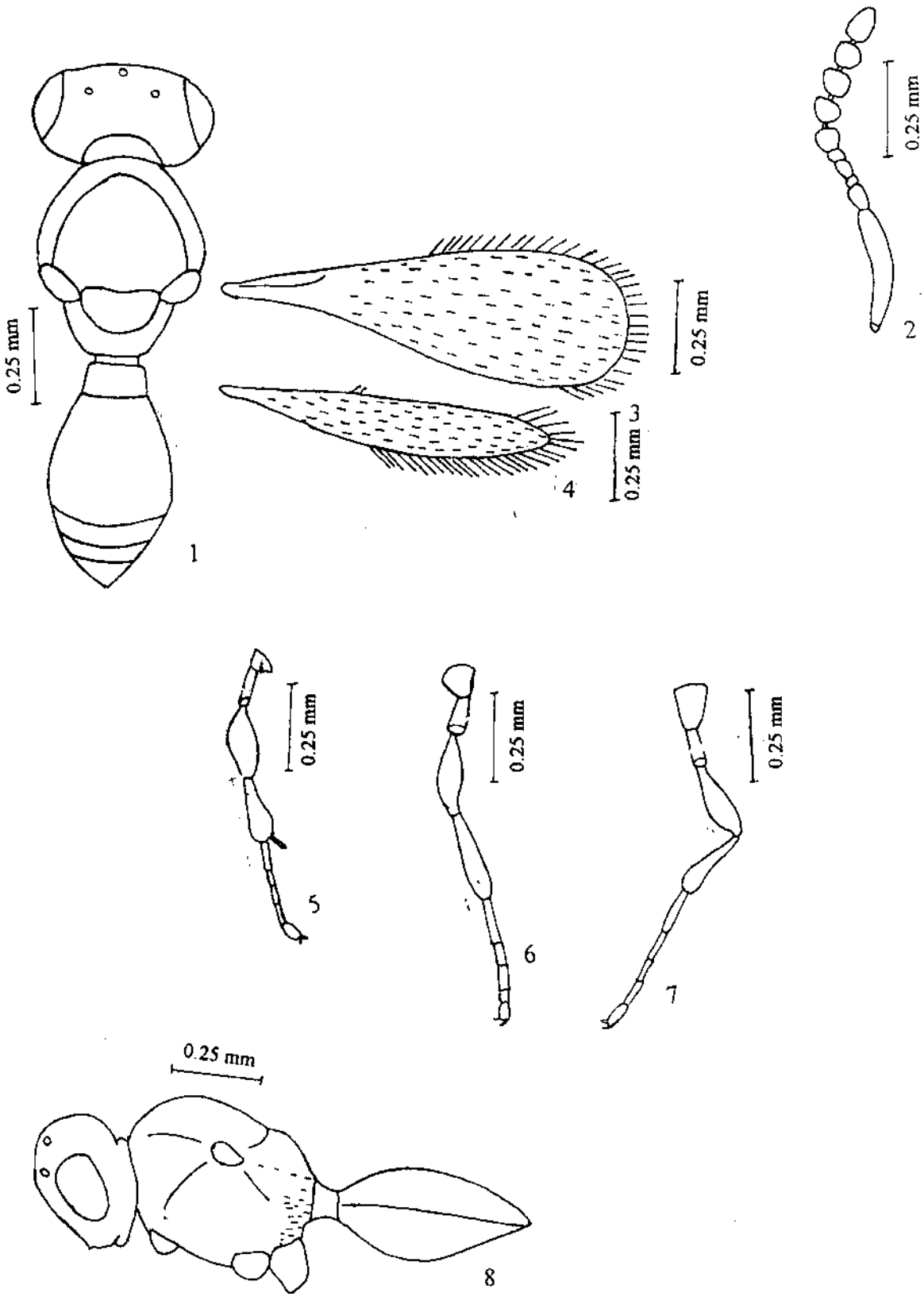


Fig. 3. *P. malabaricus* (Mukerjee)

1. Dorsal view
2. Antenna
3. Forewing
4. Hind wing
5. 1st pair of leg
6. 2nd pair of leg
7. 3rd pair of leg
8. Lateral view

Mesosoma: Smooth, sparsely hairy; notauli absent; mesoscutum width 1.86x its length; propodeum without longitudinal carina; pro and mesopleura smooth, shiny, mesopleuron slightly convex; metapleuron hairy; fore wing length 3.14x its maximum width; submarginal vein short, not straight, touching wing margin, without distal knob; marginal and apical fringe moderate; hind coxal length 1.6x its maximum width; hind femur 2.9x length of trochanter, about 4.75x its own maximum width; hind tibal length 1.5x length of metatarsus, distinctly shorter than combined length of hind tarsal segments.

Metasoma: Petiole transverse; 1.43x wide as its length, without longitudinal black lines; tergites with fine punctures; metasoma little longer than mesosoma, but distinctly shorter than length of head and mesosoma combined; about 1.86x longer than wide in dorsal view.

4.2.4 *P. minimus* (Fig. 4)

Anopedias minimus Mukerjee, 1978. *Mem. Sch. Ent.*, 5: 67-98

Female: Length 1.39 mm; body black; mandible brown; compound eyes and ocelli silvery grey; tegula brown; metasoma black; body sutures darker; all legs except last tarsal segment brown, last tarsal segment black; wings subhyaline with pilosity brown; body pubescence white.

Head: Frons reticulate and vertex with fine punctures, shiny without hairs; antennal sockets close to clypeal border; head width in dorsal view about 2.14x times its median length; scrobe and interantennal projection indistinct; occipital carina not distinct; head wider than mesosoma in dorsal view; antenna 10 segmented; relative length of antenna:body - 58:43; relative length:width of antennal segments: Scape - 20:4; pedicel - 5:4; F_1 - 2.5:3; F_2 - 2:2; F_3 - 2:2; F_4 - 3:3; F_5 - 4.5:4; F_6 - 4.5:4; F_7 - 4.5:4; F_8 - 7:5.

Mesosoma: Smooth, sparsely hairy; notauli present; mesoscutum width 2.25x its length; propodeum without longitudinal carina; pro and mesopleura smooth, shiny,

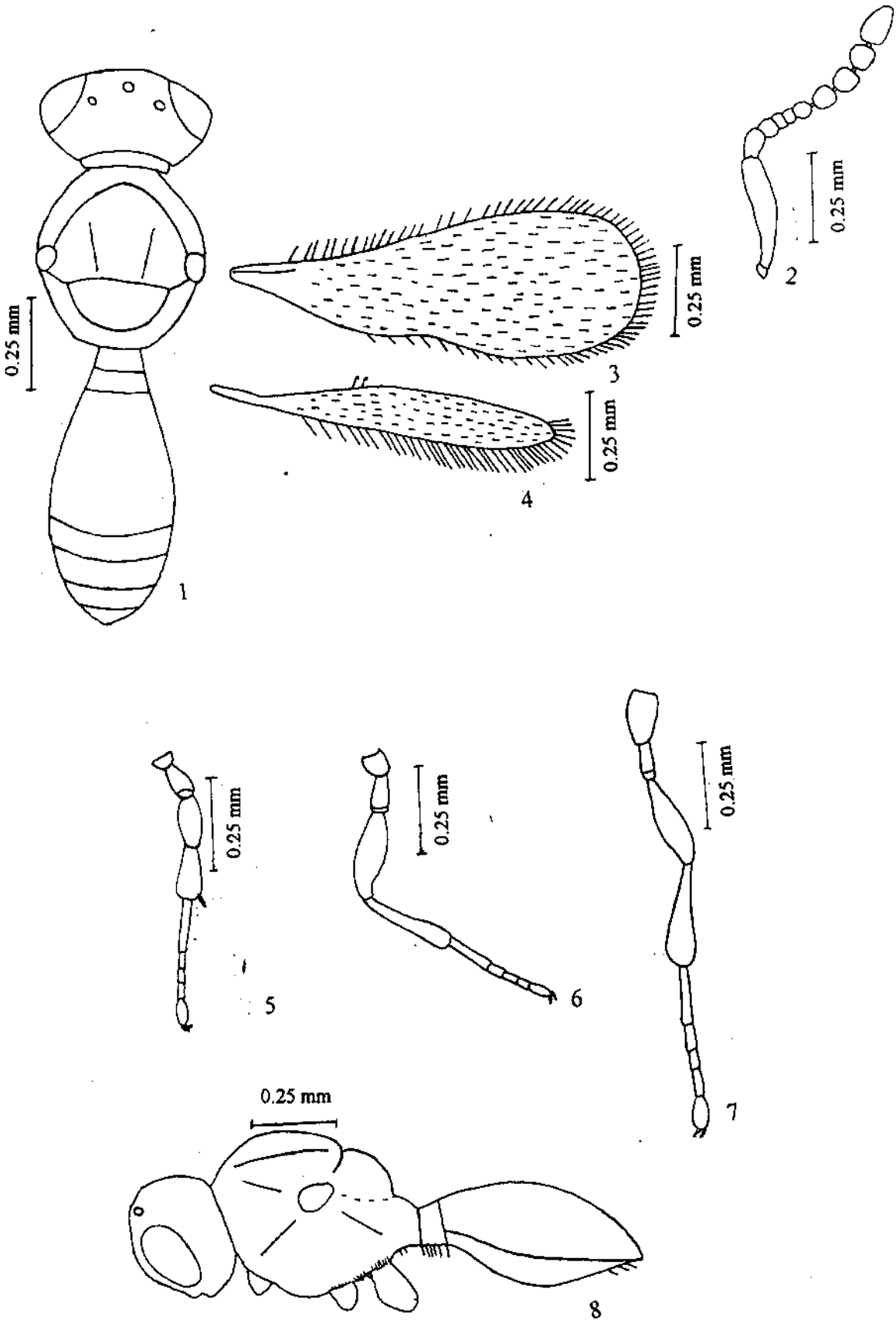


Fig. 4. *P. minimus* (Mukerjee)

1. Dorsal view
2. Antenna
3. Forewing
4. Hind wing
5. 1st pair of leg
6. 2nd pair of leg
7. 3rd pair of leg
8. Lateral view

mesopleuron more convex; metapleuron with hairs; fore wing length 2.77x its maximum width; submarginal vein short, straight, not touching wing margin and without distal knob; marginal fringe short, apical fringe moderate; hind coxal length 1.6x its maximum width; hind femur 2.67x length of trochanter, 3.2x its own maximum width; hind tibial length 1.8x length of metatarsus, distinctly shorter than combined length of hind tarsal segments.

Metasoma: Petiole transverse; 1.38x wide as its length, without longitudinal black lines, tergite with punctures and hairs; metasoma longer than mesosoma, little shorter than length of head and mesosoma combined; about 2.14x longer than wide in dorsal view.

4.2.5 *P. oryzae* (Fig. 5)

Female: Length 1.1 mm; body black; mandible brown; compound eyes and ocelli silvery grey; tegula brown; metasoma black; body sutures light; all legs except last tarsal segment brown, last tarsal segment black; wings subhyaline with pilosity brown; body pubescence white.

Head: Frons smooth and vertex with fine punctures, shiny, without hairs; antennal socket close to clypeal border; head width in dorsal view about 1.85x its median length; scrobe and interantennal projection indistinct; occipital carina distinct; head wider than mesosoma in dorsal view; antenna 10 segmented; relative length of antenna:body - 78:53; relative length:width of antennal segments: Scape - 26:5; pedicel - 8:4; F_1 - 4:3; F_2 - 3:3; F_3 - 3.5:3; F_4 - 4:4; F_5 - 4:4; F_6 - 6:5; F_7 - 6:5; F_8 - 8:4.

Mesosoma: Smooth, sparsely hairy; notauli present; mesoscutum width 1.5x its length; propodeum without longitudinal carina; pro and meso pleura smooth; mesopleuron more convex; meta pleuron hairy; fore wing length 2.76x its maximum width; submarginal vein absent; marginal fringe short, apical fringe moderate; hind coxal length 2x its maximum width; hind femur 2.8x length of trochanter, 3.5x its own maximum width; hind tibial length 2.29x length of metatarsus, distinctly shorter than combined length of hind tarsal segments.

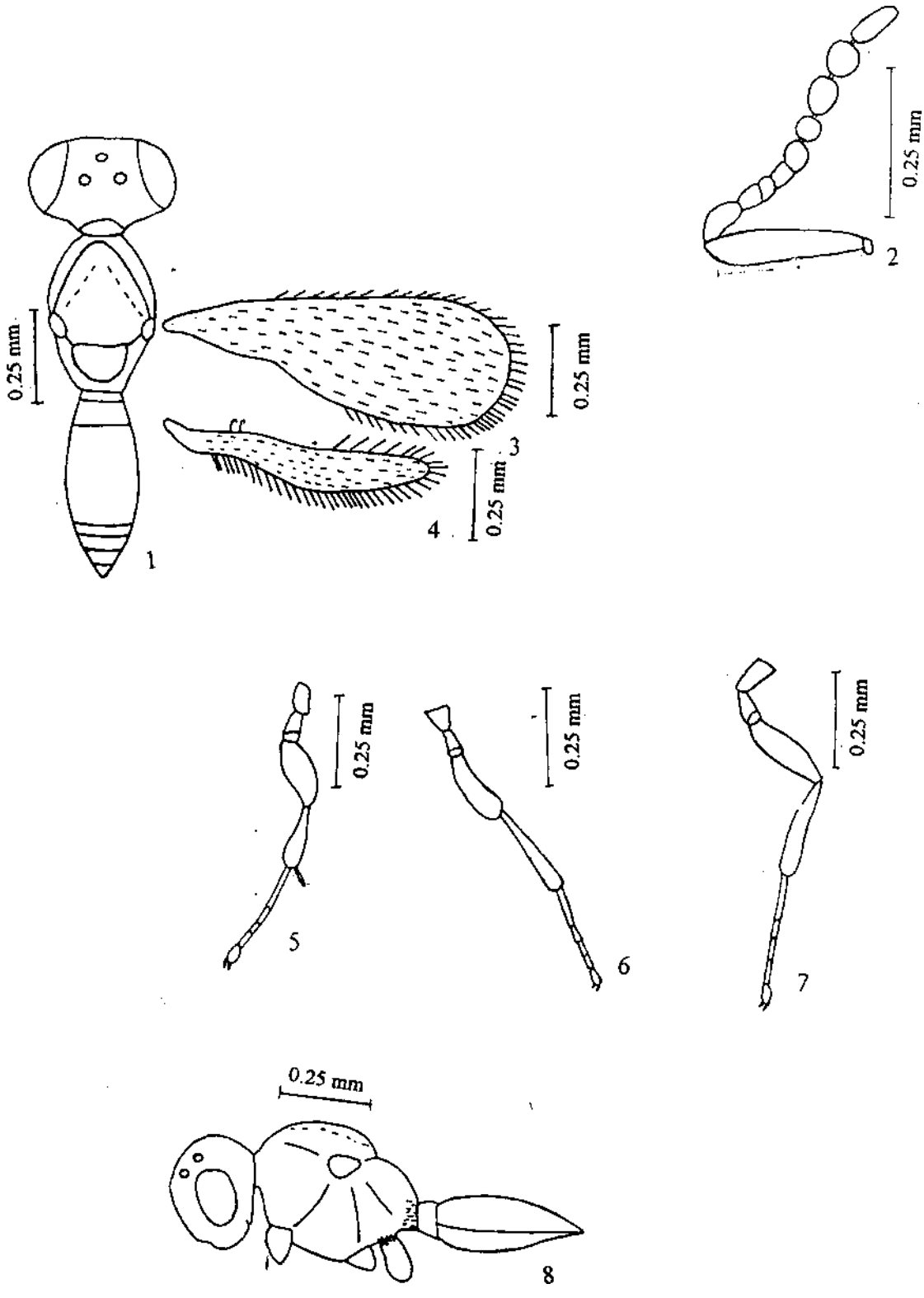


Fig. 5. *P. oryzae* Cameron

1. Dorsal view
2. Antenna
3. Forewing
4. Hind wing
5. 1st pair of leg
6. 2nd pair of leg
7. 3rd pair of leg
8. Lateral view

Metasoma: Petiole transverse; 1.5x wide as its length, without longitudinal black lines; tergites smooth; metasoma little longer than mesosoma, but distinctly shorter than length of head and mesosoma combined; about 2.58x longer than wide in dorsal view.

4.2.6 *P. sasii* (Fig. 6)

Female: Body length 2 mm; body black; mandible brown; compound eyes and ocelli silvery grey; tegula black, shiny; metasoma black; body sutures more darker; all legs except last tarsal segment brown, last tarsal segment black; wings subhyaline with **pilosity brown; body pubescence white.**

Head: Frons reticulate and vertex with fine punctures, shiny without pubescence; antennal sockets close to clypeal border; head width in dorsal view about 2.44x its median length; scrobe and interantennal projection indistinct; occipital carina indistinct; head wider than mesosoma in dorsal view; antenna 10 segmented; relative length of antenna:body - 91.5:63; relative length:width of antennal segments: Scape - 27:5; pedicel - 8:4; F_1 - 5:3; F_2 - 5:3; F_3 - 6:4; F_4 - 5:4; F_5 - 5:4; F_6 - 7:4; F_7 - 8:4; F_8 - 10:4.

Mesosoma: Smooth, hairy; notauli present; mesoscutum width 1.6x its length; propodeum without longitudinal carina; pro and mesopleura smooth, shiny, mesopleuron slightly convex; metapleuron hairy; fore wing length 2.59x its maximum width; submarginal vein short, straight, not touching wing margin, and without distal knob; marginal fringe short, apical fringe moderate; hind coxal length 1.33x its maximum width; hind femur 1.8x length of trochanter, about 2.5x its own maximum width; hind tibial length 1.47x length of metatarsus, distinctly shorter than combined length of hind tarsal segments.

Metasoma: Petiole not transverse, 0.77x wide as its length, longitudinal lines present with few hairs; tergites with fine punctures and hairs; metasoma longer than mesosoma, but shorter than length of head and mesosoma combined; about 2.8x longer than wide in dorsal view.

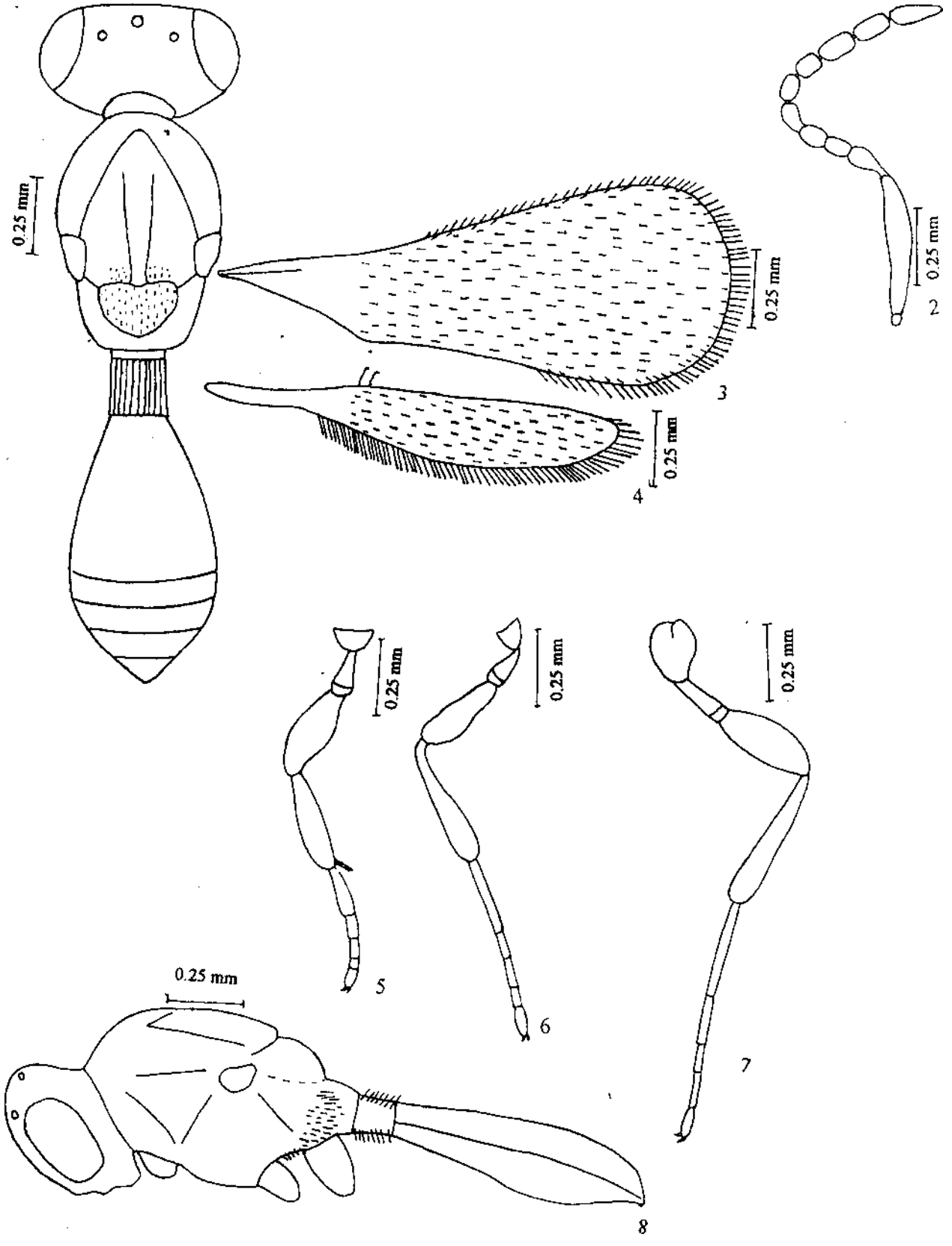


Fig. 6. *P. sasii* Ushakumari

1. Dorsal view
2. Antenna
3. Forewing
4. Hind wing
5. 1st pair of leg
6. 2nd pair of leg
7. 3rd pair of leg
8. Lateral view

4.3 FLUCTUATION OF PLATYGASTERID PARASITOID POPULATION

The data on the populations of platygasterid parasitoids collected at weekly intervals in three locations each of Ollukkara and Madakkathara panchayats during the 'virippu' and 'mundakan' seasons were analyzed and the locational, seasonal and varietal variations have been presented.

4.3.1 Between locations

The *Platygaster* population per net sweeping is given in Table 1. Significant locational variations in the incidence of *Platygaster* were not detected, the mean parasitoid populations per net sweep during the 'virippu' season being 3.52 in Ollukkara and 3.57 in Madakkathara Panchayats. But during mundakan season slightly higher population was observed at Ollukkara (7.1) than at Madakkathara (6.42) (Fig. 7).

4.3.2 Between 'virippu' and 'mundakan' seasons

The observation on the population of platygasterid parasitoids was taken from the fourth week of July to second week of September in 'virippu' season and from third week of October to first week of December in 'mundakan' season (Table 1). The peak *Platygaster* population in the 'virippu' season synchronized with the first week of September in both panchayats, i.e., 5.33 in Ollukkara and 5.66 in Madakkathara. In 'mundakan' season the maximum population was observed during the second week of November in Ollukkara (14) and last week of November in Madakkathara (9.66).

There is significant difference in *Platygaster* population between the two seasons (Fig. 8). In 'mundakan' season, significantly higher population (6.76) of *Platygaster* parasitoids was observed as compared to the mean level of only 3.55 in the 'virippu' season.

4.3.3 Between Jyothi and Chitteni varieties

The high yielding variety Jyothi was cultivated in location I and II of both Ollukkara and Madakkathara panchayats. In location III of both the panchayats, the

Table 1. Population of platygasterid parasitoids during the 'virippu' and 'mundakan' seasons

(Number/net sweep)

Period	Virippu		Mean	Month/ week	Mundakan		Mean
	Ollukkara	Madak-kathara			Ollukkara	Madak-kathara	
July 2002				**October 2002**			
4th week	2.33	2.33	2.33	3rd week	5.33	3.66	4.50
				4th week	9.33	5.00	7.17
August 2002				**November 2002**			
1st week	2.33	3.33	2.83	1st week	10.33	5.33	7.83
2nd week	4.00	2.66	3.33	2nd week	14.00	6.33	10.17
3rd week	4.33	2.33	3.33	3rd week	7.00	8.33	7.67
4th week	5.00	4.33	4.67	4th week	3.00	9.66	6.33
September 2002				**December 2002**			
1st week	5.33	5.66	5.59	1st week	0.33	6.66	3.50
2nd week	1.33	4.33	2.83				
Mean	3.52	3.57	3.55	Mean	7.10	6.42	6.76

ANOVA Table

Variables	F ratio	Table F	
		1%	5%
Location	9.13	16.26	6.61
Seasons	62.53**		
CD	8.39		

** Significant at 1% level

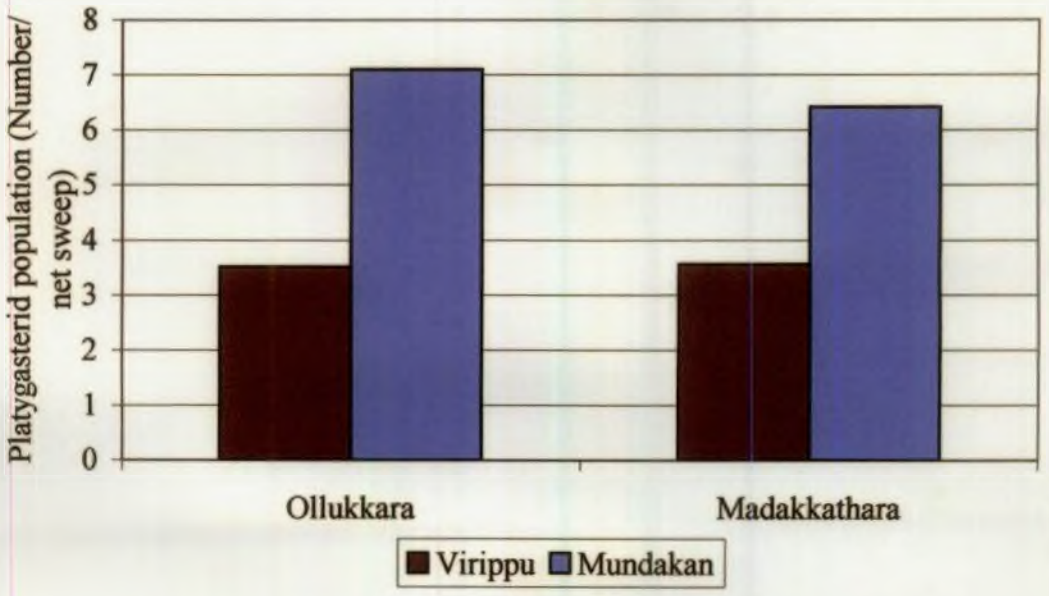


Fig. 7. Population of platygasterid parasitoids in Ollukkara and Madakkathara panchayats

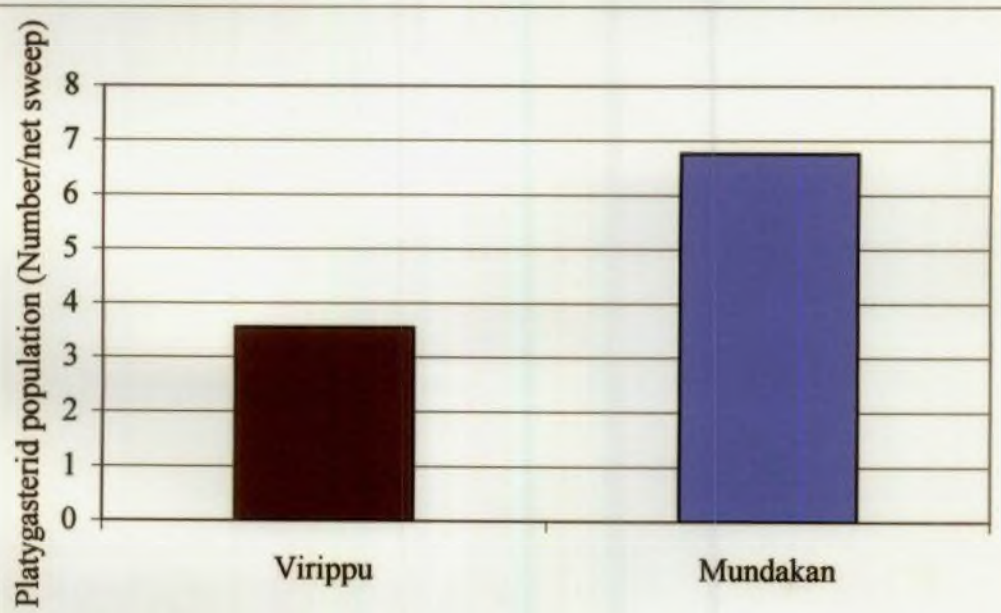


Fig. 8. Population of platygasterid parasitoids in virippu and mundakan season

local variety Chitteni was cultivated. The *Platygaster* population in Jyothi and Chitteni during 'virippu' and 'mundakan' season is given in Table 2.

From the observations it is found that the *Platygaster* population is significantly higher in the variety Jyothi in both 'virippu' and 'mundakan' seasons (Fig. 9). In Jyothi variety, the population of platygasterid parasitoid was 4.25 and 8.21 number in 'virippu' and 'mundakan' season respectively. In Chitteni it was only 2.42 in 'virippu' and 5.42 in 'mundakan' season.

4.4 PER CENT PARASITISM

4.4.1 Between locations

The variation in per cent parasitism was observed in all the locations during the two crop seasons (Table 3). The mean per cent parasitism during 'virippu' season in Ollukkara is 16.87 where as in Madakkathara it is 24.36. During 'mundakan' season it is observed that parasitism was higher at Ollukkara (37.96 per cent) than at Madakkathara (29.96 per cent) (Fig. 10). However, these variation failed to attain the level of significance.

4.4.2 Between 'virippu' and 'mundakan' seasons

The maximum per cent parasitism was observed during the third week of September in 'virippu' season (25.69) and last week of October in 'mundakan' season (44.17) in both panchayats.

The mean per cent parasitism in 'virippu' season is 20.67 and in 'mundakan' season it is 33.94. The per cent parasitism is found to be significantly higher in 'mundakan' season (Fig. 11).

4.4.3 Between Jyothi and Chitteni varieties

The per cent parasitism in the varieties Jyothi and Chitteni are calculated and presented in the Table 4. It is observed that the per cent parasitism shows no significant difference between the two varieties (Fig. 12).

Table 2. *Platygaster* population in Jyothi and Chitteni varieties of rice (Number/net sweep)

Period of observation	Virippu		Mundakan	
	Jyothi	Chitteni	Jyothi	Chitteni
1st week	2.5	2.0	5.4	3.0
2nd week	3.0	2.5	7.3	7.0
3rd week	3.5	3.0	9.3	5.0
4th week	**4.0**	**2.0**	**11.8**	**7.0**
5th week	5.5	2.5	9.5	4.0
6th week	7.0	2.5	6.3	6.5
Mean	4.3	2.4	8.2	5.4

ANOVA Table

Variables	F ratio		Table F	
	Virippu	Mundakan	1%	5%
Weekly interval	1.18	6.13	16.26	6.60
Varieties	7.30*	25.27**		
CD	1.94	1.00		

* Significant at 5% level

** Significant at 1% level

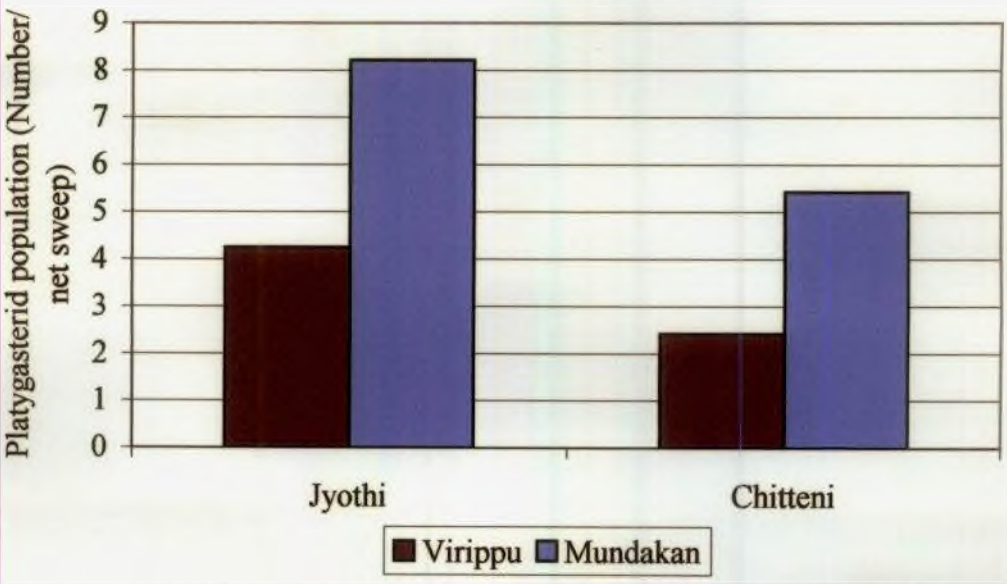


Fig. 9. Population of platygasterid parasitoids in Jyothi and Chitteni varieties of rice

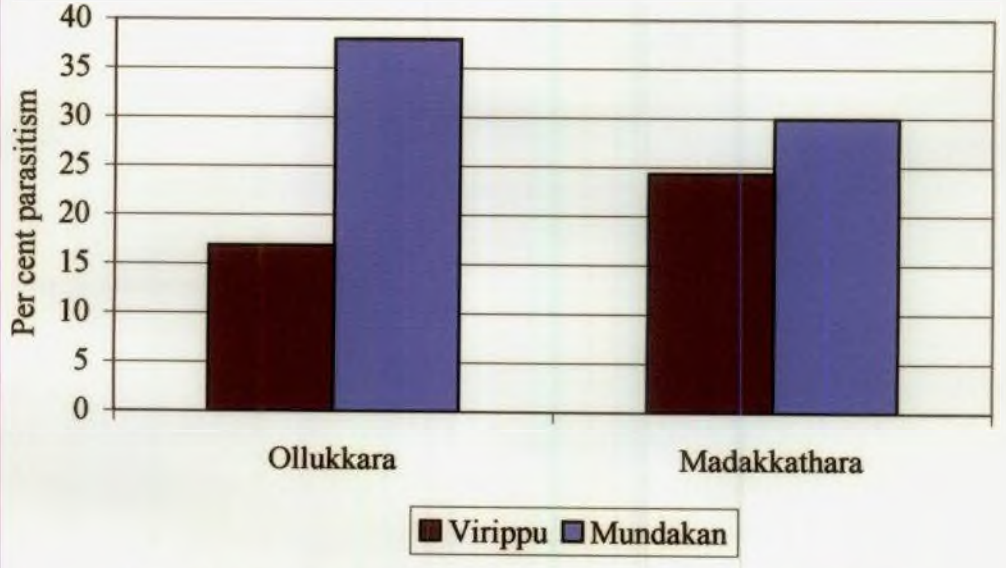


Fig. 10. Per cent parasitism of platygasterid parasitoids in Ollukkara and Madakkathara panchayats

Table 3. Per cent parasitism of platygasterid parasitoids in 'virippu' and 'mundakan' seasons

Period	Virippu		Mean	Month/ week	Mundakan		Mean
	Ollukkara	Madak-kathara			Ollukkara	Madak-kathara	
July 2002				**October 2002**			
4th week	13.59	18.13	15.86	3rd week	46.77	23.62	35.20
				4th week	48.27	40.06	44.17
August 2002				**November 2002**			
1st week	16.02	23.33	19.68	1st week	43.00	39.94	41.47
2nd week	20.87	25.03	22.95	2nd week	38.92	29.90	34.41
3rd week	21.87	29.47	25.69	3rd week	26.19	25.26	27.73
4th week	16.57	27.80	22.19	4th week	24.61	20.74	22.68
September 2002							
1st week	12.27	22.37	17.33				
Mean	16.87	24.36	20.67	Mean	37.96	29.96	33.94

ANOVA Table

Variables	F ratio	Table F	
		1%	5%
Location	0.427	16.25	6.61
Seasons	9.096*		
CD	48.2		

** Significant at 1% level

Table 4. Per cent parasitism of galls in Jyothi and Chitteni varieties of rice

Period of observation	Virippu		Mundakan	
	Jyothi	Chitteni	Jyothi	Chitteni
1st week	19.70	8.20	35.30	24.99
2nd week	21.71	31.20	43.20	41.50
3rd week	25.58	35.40	41.46	41.50
4th week	30.35	32.60	33.35	36.54
5th week	24.63	34.10	24.30	28.57
6th week	19.53	25.80	20.68	26.67
Mean	23.58	27.98	33.05	33.18
	25.78		33.12	

ANOVA Table

Variables	F ratio		Table F	
	Virippu	Mundakan	1%	5%
Weekly interval	2.53	6.96	16.26	6.61
Varieties	1.68^{NS}	0.11^{NS}		

NS - Non significant

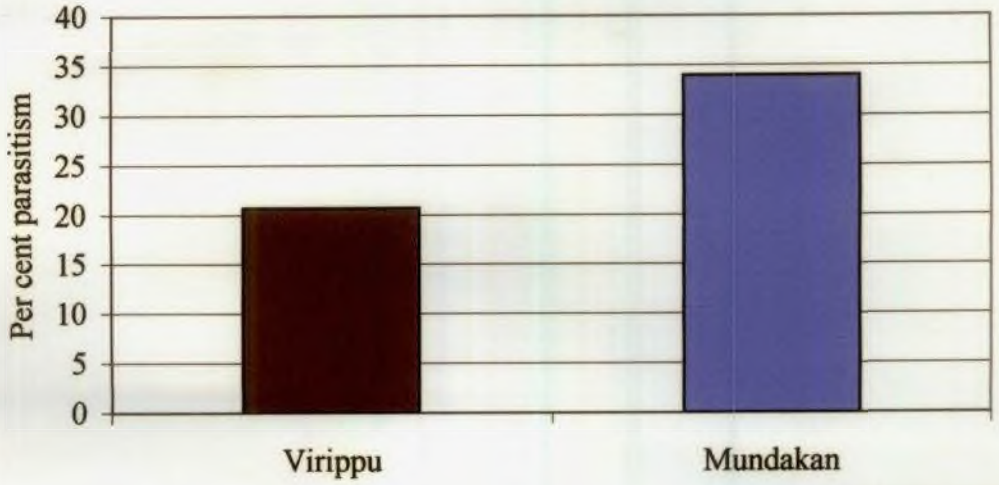


Fig. 11. Per cent parasitism of platygasterid parasitoids in virippu and mundakan season

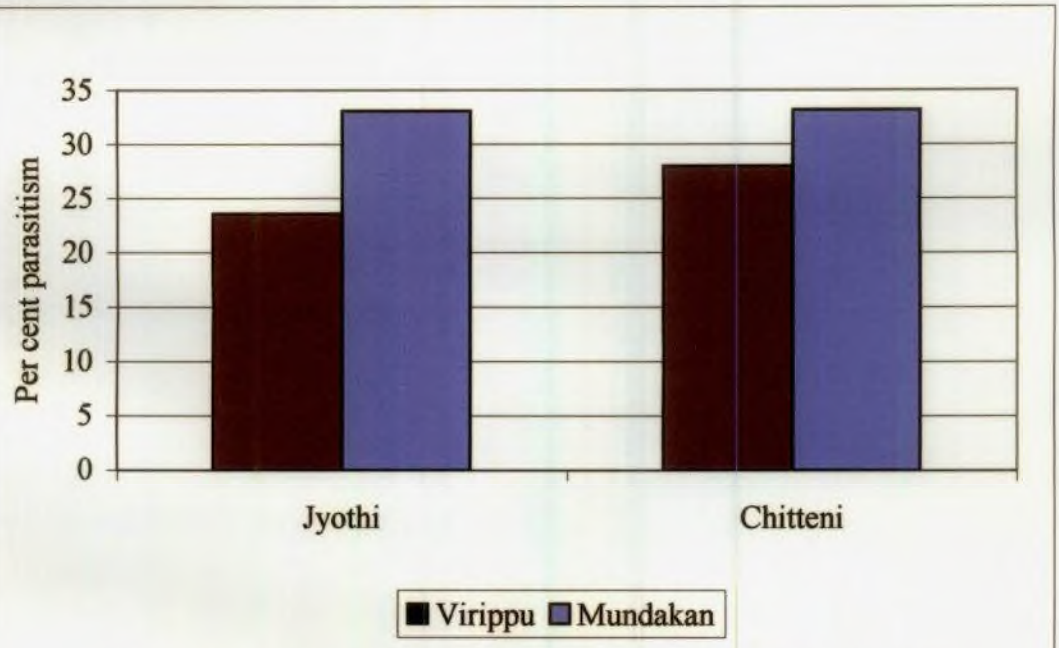


Fig. 12. Per cent parasitism of platygasterid parasitoids in Jyothi and Chitteni varieties

4.5 EMERGENCE OF *PLATYGASTER* PARASITOIDS FROM THE GALLS

The complete emergence of the *Platygaster* parasitoids from the parasitised galls was observed with in 2-3 days. On the first day, maximum number emerged which reduced during the subsequent days.

Two types of *Platygaster* were observed based on the number of parasitoids emerging from the galls, namely, the solitary and the gregarious types. The solitary type is identified as *P. sasii* and the gregarious type include *P. coorgensis*, *P. minimus* and *P. oryzae*.

In the case of the gregarious species, the number of parasitoids emerged range between 14 and 56 per galls. The average number of *Platygaster* per gall is 31.1 (Table 5). It is observed that the same species of *Platygaster* emerged from single gall.

4.6 OTHER HYMENOPTERAN PARASITOIDS

4.6.1 From galls (Plate 1)

Seven species of other hymenopteran parasitoids also emerged from the galls on rearing. These are *Eurytoma* sp. (Eurytomidae), *Litus* sp. (Pteromalidae), *Neanastatus cinctiventris* Girault (Eupelmidae), *Telenomus* sp. (Scelionidae), one species of Eucoilidae and two species of Mymaridae.

Among these parasitoids *Eurytoma* sp., *Litus* sp., species of Eucoilidae and Mymaridae emerged along with the *Platygaster* from the same gall whereas *N. cinctiventris* Girault and *Telenomus* sp. emerged from separate galls.

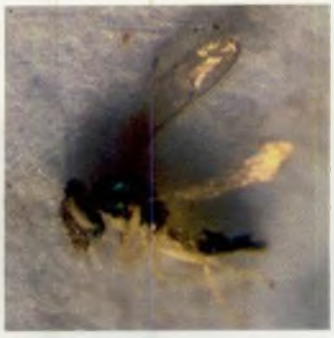
4.6.2 From net sweeping

Some other hymenopteran parasitoids was also observed in the sweepings. The species belonging to the families Ichneumonidae, Braconidae, Chalcididae, Scelionidae, Pteromalidae and Mymaridae were the relatively more numerous among them.

Table 5. Number of *Platygaster* parasitoids per rice gall

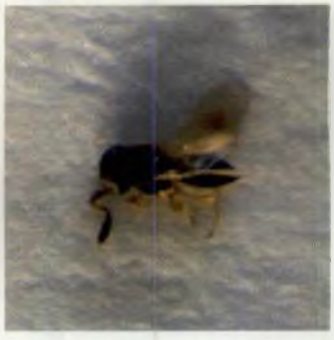
Gall No.	No. of *Platygaster* parasitoids/gall
1	20
2	27
3	24
4	29
5	20
6	34
7	56
8	14
9	43
10	44
Mean	31.1

A



B

C



D

E

F

G

Plate 1. Other hymenopteran parasitoids from rice galls

A - *Eurytoma* sp. (Eurytomidae)
B - *Litus* sp. (Pteromalidae)
C - *Neanastatus cinctiventris* Girault (Eupelmidae)
D - *Telenomus* sp. (Scelionidae)
E - Species of Eucoilidae (Unidentified)
F - Species of Mymaridae (Unidentified)
G - Species of Mymaridae (Unidentified)

4.7 VARIETAL REACTION

The germplasm collection raised at RARS, Pattambi was observed for the presence of gall fly infestation and platygasterid parasitoids. In 'mundakan' 2002, 179 accessions and in kharif 2003, 50 accessions were observed (Table 6 and 7).

During the 'mundakan' season, the population of gall fly and *Platygaster* parasitoids were absent in the net sweeping and also there was no galls in the varieties studied. During 'virippu', gall infestation was observed in the varieties Red Ponmani, CO-42, IET-13358, MTU-7 and Kuruva, but *Platygaster* parasitoids were not recorded from these varieties.

Table 6. Rice varieties observed in 'mundakan' 2002-2003

Sl.No.	Varieties	Gall infestation	Platygasterid parasitoids
1	2001 (Shooranad)	-	-
2	25 A	-	-
3	25 B	-	-
4	ADT-40	-	-
5	ARC-14172	-	-
6	ARC-14179	-	-
7	ARC-14184	-	-
8	ARC-14381	-	-
9	ARC-14446	-	-
10	ARC-14842	-	-
11	Arikilari	-	-
12	Arikirazhi Mundakan	-	-
13	Aruvakkari	-	-
14	Athikiraya	-	-
15	Athikiraya (Sel-1)	-	-
16	Athivasinellu	-	-
17	Athivasinellu (Sel-1)	-	-
18	Athivasinellu (Sel-2)	-	-
19	Athivasinellu (Sel-3)	-	-
20	Athiyan (Thrissur)	-	-
21	Basmathy-370 (White)	-	-
22	Black Chitteni (Tavanur)	-	-
23	C, 3-2	-	-
24	Chempavu	-	-
25	Chempavu (Thamarakulam)	-	-
26	Chentharmani (LMN 2001-7)	-	-
27	Chenthondy	-	-
28	Cheradi (Kottarakkara)	-	-
29	Cheriya Ariyan	-	-
30	Cheriyachitteni	-	-
31	Cherukumbalam	-	-
32	Cherukumbalam (Sel-1)	-	-
33	Chettadi	-	-
34	Chettadi (Ambalapara)	-	-
35	Chettuveliyan	-	-
36	Chitteni	-	-
37	Chitteni (Alathur)	-	-
38	Chomala	-	-
39	Chomala (Sel-1)	-	-

Contd.

Table 6. Continued

Sl.No.	Varieties	Gall infestation	Platygasterid parasitoids
40	Choorepundy	-	-
41	Chuvanna Chitteeni	-	-
42	**Chuvannachettadi**	-	-
43	Chuvannachettadi (Sel-1)	-	-
44	Chuvannachettadi (Sel-1)	-	-
45	Chuvannachitteni	-	-
46	Chuvannachitteni (Kootanad)	-	-
47	Chuvannachitteni (Ongallur)	-	-
48	Chuvannaitti	-	-
49	Chuvannaponmani	-	-
50	Chuvappan (Malappuram)	-	-
51	Collection from tribal colony	-	-
52	Gandhagasala (LMN 2001-10)	-	-
53	Gandhagasala (LMN 2001-11)	-	-
54	Gandhagasala (NH)	-	-
55	Gandhasala	-	-
56	Gandhasala (LMN 2001-12)	-	-
57	H 4	-	-
58	Harsha	-	-
59	Ittikandappan	-	-
60	Kalathekkan	-	-
61	Kalinga	-	-
62	Kalyani Matta	-	-
63	Kar (NH)	-	-
64	Karamundakan (Vallikunnu)	-	-
65	Karanellu	-	-
66	Karanellu (Sel-2)	-	-
67	Karimodan	-	-
68	Karutha Chitteni,	-	-
69	Karuthachitteni	-	-
70	Karuthachitteni (Kootanad)	-	-
71	Kayama	-	-
72	Kochumundon	-	-
73	Kochumundon (Sel-1)	-	-
74	Kochumundon (Sel-2)	-	-
75	Kochumundon (Sel-3)	-	-
76	Kochumundon (Sel-4)	-	-
77	Kodiyan (Kunnamkulam)	-	-
78	Kodiyathur (ugrapuram)	-	-

Contd.

Table 6. Continued

Sl.No.	Varieties	Gall infestation	Platygasterid parasitoids
79	Kokkan Koli	-	-
80	Konna	-	-
81	Konna (Sel-1)	-	-
82	Konna (Sel-2)	-	-
83	Konna (Sel-3)	-	-
84	Konna (Sel-4)	-	-
85	Koorimundakan (Palakkad)	-	-
86	Kothambalari Kayama	-	-
87	Kunhikannan	-	-
88	Kunhikuruvi	-	-
89	Kururai	-	-
90	Kuttadan	-	-
91	Kuttadan (Kozhikode)	-	-
92	Lakshmi (Pallikkal)	-	-
93	Mattakuruva	-	-
94	MSSR 001391	-	-
95	MSSR-001356	-	-
96	MSSR-001357	-	-
97	MSSR-001358	-	-
98	MSSR-001359	-	-
99	MSSR-001365	-	-
100	MSSR-001366	-	-
101	MSSR-001367	-	-
102	MSSR-001375	-	-
103	MSSR-001392	-	-
104	MSSR-001511	-	-
105	MSSR-001533	-	-
106	MSSR-001562	-	-
107	MTU-14	-	-
108	MTU-14 (Sel-1)	-	-
109	MTU-14 (Sel-2)	-	-
110	MTU-16	-	-
111	MTU-17	-	-
112	Munda	-	-
113	Munda (Sel-1)	-	-
114	Munda (Sel-2)	-	-
115	Munda (Sel-3)	-	-
116	Munda (Sel-4)	-	-
117	Munda (Sel-5)	-	-

Contd.

Table 6. Continued

Sl.No.	Varieties	Gall infestation	Platygasterid parasitoids
118	Mundakakutty (Erumappety)	-	-
119	Mundakakutty (Sel-1)	-	-
120	Mundakakutty (Sel-3)	-	-
121	Mundakakutty (Sel-4)	-	-
122	Mundakakutty (Sel-5)	-	-
123	Mundakan Black (Karthikapalli)	-	-
124	Mundakan-Vella	-	-
125	Mundavan	-	-
126	Mundon	-	-
127	Muthu	-	-
128	Oorpandy	-	-
129	Ooru Mundakan (Karthikapalli)	-	-
130	Orissa	-	-
131	OTP	-	-
132	Palakkadan	-	-
133	Palthondy (LMN 2001-8)	-	-
134	Pathomabathara	-	-
135	Peruvaya	-	-
136	Pokkali	-	-
137	Pokkali-2	-	-
138	Pokkali-5	-	-
139	Pookulakodiyan	-	-
140	Pookulathari	-	-
141	PTB-1 (Pallikkal)	-	-
142	Punjakayama	-	-
143	Pusa	-	-
144	Red Chitteni (Tavanur)	-	-
145	Red Ponmani (Chittoor)	-	-
146	Red Shakthi	-	-
147	Rocket	-	-
148	Sabitha	-	-
149	Sukanya	-	-
150	Sundari	-	-
151	Sury (Ambalapara)	-	-
152	Sury (Sel-1)	-	-
153	Thaichingham	-	-
154	Thiruvonam (Ollukkara)	-	-
155	Thonnuran (LMN 2001-6)	-	-
156	TNAU-01032	-	-

Contd.

Table 6. Continued

Sl.No.	Varieties	Gall infestation	Platygasterid parasitoids
157	Undakayama	-	-
158	UR-19 (Shooranad)	-	-
159	UR-19 (Thamarakulam)	-	-
160	Uralankayama	-	-
161	Valichoori	-	-
162	Valichoori (LMN 2001-14)	-	-
163	Valiyaittikannan	-	-
164	Varinellu (LNM-2001-25)	-	-
165	Varsha	-	-
166	Vattan	-	-
167	Vayalithoova	-	-
168	Veliyan	-	-
169	Vellachettadi	-	-
170	Vellachettadi (Sel-1)	-	-
171	Vellakokkan (Kootanad)	-	-
172	Vellakokkan (Sel-1)	-	-
173	Vellamthangi	-	-
174	Vellari	-	-
175	Vellari (Ongallur)	-	-
176	Veluthakattamodan	-	-
177	Vrichikapandy (Amayur)	-	-
178	White Chitteni (Tavanur)	-	-
179	White Shakthi	-	-

+ = Presence
- = Absence

Table 7. Rice varieties observed in 'virippu' 2003

Sl.No.	Varieties	Gall infestation	Platygasterid parasitoids
1	9409-12	-	-
2	9409-14	-	-
3	96-34-3	-	-
4	Arikkirazhi	-	-
5	Awned varient from Red Ponmani	-	-
6	Badsha bog	-	-
7	Black varient from Ponmani	-	-
8	Chempan (NG)	-	-
9	Chenkayama (Ambalappara)	-	-
10	Chenkayama (NG)	-	-
11	Cherukumbalam-11	-	-
12	Cherumailaran	-	-
13	Chettuvelian-1	-	-
14	Chettuvelian-2	-	-
15	CO-42	+	-
16	DRR-INRC No.5358	-	-
17	Gandhasala	-	-
18	Gandhasala	-	-
19	IET-13358	+	-
20	IR-42	-	-
21	IR-5	-	-
22	Jeerakasala	-	-
23	Jeerakasala	-	-
24	JJK-2000-195-TCR-6975	-	-
25	Kattamodan (NG)	-	-
26	Kochuvithu	-	-
27	Kokkankoli	-	-
28	Kothambalankayama	-	-
29	Kothondan	-	-
30	Krishnaveni	+	-
31	Kunju Kunju	-	-
32	Kuruva	+	-
33	Kuttithekka	-	-
34	MRST-81	-	-
35	MTU-1	-	-
36	MTU-6	-	-
37	MTU-7	+	-
38	Mullanpuncha	-	-
39	Navara	-	-

Contd.

Table 7. Continued

Sl.No.	Varieties	Gall infestation	Platygasterid parasitoids
40	Oorumundakan	-	-
41	Palakkadan	-	-
42	Pandichamban	-	-
43	Pankaj	-	-
44	Pokkali (brown)	-	-
45	Red Ponmani	+	-
46	Swarnadhan	-	-
47	Vadakkankaram	-	-
48	Valiathavalakannan (NG)	-	-
49	Vellakayama	-	-
50	Vetteri (NG)	-	-

+ = Presence
- = Absence

Discussion

5. DISCUSSION

The results of the present investigation on the species diversity, morphology and morphometrics, per cent parasitism and varietal reaction of platygasterid parasitoids are discussed in this chapter.

5.1 SPECIES DIVERSITY

During the survey, collection of platygasterid parasitoids was done by net sweeping and rearing. Collection was made from three locations each of Ollukkara and Madakkathara panchayats during virippu and mundakan seasons.

5.1.1 In rice

Six species of *Platygaster* were observed in the net sweeping. They are *P. coorgensis*, *P. inderdaadi*, *P. malabaricus*, *P. minimus*, *P. oryzae* and *P. sasii*. In the *in situ* collection, *P. coorgensis*, *P. minimus*, *P. oryzae* and *P. sasii* were emerged from the galls.

The five other species of *Platygaster* reported in the present investigation are new records from rice gall fly.

In India many workers reported *P. oryzae* as the principal natural enemy of *O. oryzae*. Hidaka *et al.* (1978), Kobayashi and Kadkao (1978), Grover and Prasad (1980) Kobayashi and Kadkao (1984), Chandrakar *et al.* (1989), Sain and Kalode (1992), Kobayashi and Kudagamage (1994), Ambikadevi (1998). There are reports of other *Platygaster* species by Liu *et al.* (1981), Sain and Kalode (1992) and Beevi *et al.* (2000) parasitising *O. oryzae*. Joshi *et al.* (1984a) reported a brown species of *Platygaster* which was distinct from *P. oryzae*. But the identities of these species have not been reported. The present study corroborates these findings, as five additional species have been recorded.

5.1.2 In vegetables

The cecidomyiid galls, mealy bugs and whiteflies of vegetables were observed for the emergence of platygasterid parasitoids. There was no parasitisation by *Platygaster* species. But there are previous reports of platygasterid parasitoids in vegetables viz., *Misocyclops* sp. on cucurbit stem gall fly *L. falcata* (Ayyar, 1963) and *Amitus* sp. on white flies (Gerling, 1990; Viggiani, 1997 and Kajita, 2000).

In the present study the absence of parasitoids may be due to the regular insecticidal applications which selectively eliminated the parasitoids.

5.2 MORPHOLOGY AND MORPHOMETRICS

The identity of the species were confirmed by comparing the morphology and morphometrics with the species described by Mukerjee (1978) and Ushakumari (2002). The general characters of the species identified are given as follows.

5.2.1 *P. coorgensis*

Body length 1.13 mm, black coloured, body pubescence white, compound eyes and ocelli silvery grey, antenna 10 segmented with five club forming segments, club forming segments dark coloured, others brown, mandible brown coloured, notauli absent, scutellum slightly convex, length of antenna : body - 52 : 35, wings subhyaline with pilosity brown, submarginal vein present, all legs except last tarsal segment brown, last tarsal segment black.

5.2.2 *P. inderdaadi*

Body length 1.21 mm, black coloured, body pubescence white, compound eyes and ocelli silvery grey, antennal segments 10 with five club forming segments, all segments are brown coloured, fourth segment large sized, mandible brown, notauli absent, scutellum convex, relative length of antenna : body - 76 : 58, wings sub hyaline with pilosity brown, submarginal vein present, all legs except last tarsal segments brown, femur dark brown, last tarsal segment black.

5.2.3 *P. malabaricus*

Body length 1.3 mm, black coloured, body pubescence white, compound eyes and ocelli silvery grey, antennal segments 10 with five club forming segments, except scape all other segments black, scape brownish, mandible brown, notauli absent, scutellum convex, relative length of antenna : body - 57 : 41, wings sub hyaline with pilosity brown, submarginal vein present, all legs except last tarsal segments brown, last tarsal segment black.

5.2.4 *P. minimus*

Body length 1.39 mm, black coloured, body pubescence white, compound eyes and ocelli silvery grey, antennal segments 10 with five club forming segments, club forming segments black, others brown, mandible brown, notauli faint, scutellum convex, relative length of antenna : body - 58 : 43, wings sub hyaline with pilosity brown; submarginal vein present; all legs except last tarsal segments brown, last tarsal segment black.

5.2.5 *P. oryzae*

Body length 1.1 mm, black coloured, body pubescence white, compound eyes and ocelli silvery grey, antennal segments 10 with four club forming segments, club forming segments dark and others brown, mandible brown, notauli faint, scutellum convex, relative length of antenna : body - 78 : 53, wings sub hyaline with pilosity brown, submarginal vein absent, all legs except last tarsal segment brown, last tarsal segments black.

5.2.6 *P. sasii*

Body length 2 mm, black coloured, body pubescence white, compound eyes and ocelli silvery grey, antenna 10 segmented, thread like, five club forming segments, first three segments brownish, others black, mandible brown, notauli well distinct, scutellum convex, relative length of antenna : body - 91 : 63, wings sub

hyaline with pilosity brown; submarginal vein present; coxa and last tarsal segments black, others brown.

5.3 FLUCTUATION OF PLATYGASTERID PARASITOID POPULATION

The platygasterid count per net sweeping was taken at weekly interval during virippu and mundakan seasons from the three locations each of Ollukkara and Madakkathara panchayats.

5.3.1 Between locations .

The differences in the populations of platygasterid parasitoids in the locations of Ollukkara and Madakkathara panchayats were insignificant. This may be due to the similar agro-climatic and edaphic conditions prevailing in the two panchayats.

5.3.2 Between 'virippu' and 'mundakan' seasons

The population of platygasterid parasitoids was taken from the fourth week of July to second week of September in 'virippu' season and from third week of October to first week of December in 'mundakan' season.

There was significantly higher population of *Platygaster* in the 'mundakan' season than 'virippu' season. Peak population was observed during the second week of November in Ollukkara and last week of November in Madakkathara. This is explicable on the basis of high host population during the season.

This is in confirmation with the findings of Ramaiah (1970), Joshi *et al.* (1984a), Chandrakar *et al.* (1989), Sain and Kalode (1992) and Beevi *et al.* (2000) who also observed high population of *Platygaster* in the 'mundakan' season.

5.3.3 Between Jyothi and Chitteni varieties

The high yielding variety Jyothi was cultivated in location I and II of both panchayats and the local variety Chitteni was cultivated in location III. It was found

that the platygasterid population was significantly higher in variety Jyothi than Chitteni. The gall infestation was less in Chitteni compared to Jyothi. This may be the reason for low population of platygasterids. However, it is quite likely that the local cultivar Chitteni is relatively more resistant to gall fly infestation.

5.4 PER CENT PARASITISM

Per cent parasitism was worked out from the *in situ* collection of galls during the two crop season from both Ollukkara and Madakkathara panchayats.

5.4.1 Between locations

There was no significant variation in the per cent parasitism between Ollukkara and Madakkathara panchayats. The trend of parasitisation was higher in Madakkathara (24.36 per cent) than Ollukkara (16.87 per cent) during virippu season. But during mundakan season high level of parasitism was observed at Ollukkara (37.96 per cent) than Madakkathara (29.92 per cent).

5.4.2 Between 'virippu' and 'mundakan' season

The per cent parasitism was found to be significantly higher in mundakan season. The mean per cent parasitism in virippu season was 20.67 and in mundakan, it was 33.94. The maximum per cent parasitism was observed during the third week of September in virippu and last week of October in mundakan season in both the panchayats.

Ramaiah (1977) recorded 66.7, 78.01 and 85 per cent parasitism by *Platygaster* in September, October and November respectively. Rao *et al.* (1981) also recorded cent per cent parasitism by *Platygaster* in the second half of November. Thus the present findings are in conformity with the above results.

There is positive relationship between the platygasterid population and the gall infestation in the present study. This finding is in agreement with Chandrakar *et al.* (1989) and Rao *et al.* (1981) who also observed the same trend.

5.4.3 Between Jyothi and Chitteni varieties

It was observed that the per cent parasitism showed no significant differences between the two varieties even though the gall infestation was less in the local variety Chitteni.

5.5 EMERGENCE OF PLATYGASTERID PARASITOIDS FROM GALLS

One solitary and three gregarious species of platygasterid parasitoids emerged from the galls. In the gregarious type the number of parasitoids ranged between 14 and 56. Liu *et al.* (1981) and Chiu (1980) reported the solitary and gregarious types of *Platygaster* from rice galls in China. Kobayashi and Kadkao (1982) observed that about 60 eggs of *P. oryzae* were found per host *O. oryzae* and almost all eggs that were deposited could develop to adult stage.

5.6 OTHER HYMENOPTERAN PARASITOIDS FROM RICE GALLS

Seven species of other hymenopterans were emerged from the galls at the time of rearing viz., *Eurytoma* sp., *Litus* sp. (Pteromalidae), *N. cinctiventris* Girault (Eupelmidae), *Telenomus* sp. (Scelionidae), one species of Eucoilidae and two species of Mymaridae. Of these seven species *Eurytoma* sp. and *N. cinctiventris* were already reported from galls from India and the others are new reports. All these seven species of other hymenopteran parasitoids are new reports from rice galls in Kerala.

Ramaiah (1970), Rai *et al.* (1976), Hummelen and Soenarjo (1977), Rao *et al.* (1983), Potineni and Agarwal (1984), Patnaik and Satpathy (1984), Shrivastava *et al.* (1987), Das *et al.* (1987), Bhardwaj *et al.* (1988), Chandrakar *et al.* (1989), and Mathur *et al.* (1991) reported the eupelmid *N. grallarius* (Masi) as the natural enemy of *O. oryzae*. According to Dey *et al.* (1999), *N. cinctiventris* is the synonym of *N. grallarius*.

The occurrence of *Eurytoma* sp. was reported by Rao *et al.* (1983), Das *et al.* (1987), Mathur *et al.* (1989), Kobayashi *et al.* (1990), Kobayashi *et al.* (1991) and Sain and Kalode (1992).

5.7 VARIETAL REACTION

There was no gall fly infestation and platygasterid parasitoids in the rice varieties studied during 'mundakan' 2002 season at RARS, Pattambi. During 'virippu' 2003 out of the 50 varieties observed, gall infestation was seen in the varieties Red Ponmani, CO-42, IET-13358, MTU-7 and Kuruva, but no *Platygaster* parasitoids were recorded from these varieties. The low gall infestation and the absence of parasitoids may be due to prophylactic management practices adopted to protect the germplasm accessions.

Summary

6. SUMMARY

Platygasterid parasitoids are coming under the family Platygasteridae of order Hymenoptera. They are mainly parasitic on gall forming cecidomyiids and other pests like white flies and mealy bugs. They are very minute and black coloured wasps. The observations on the species diversity, morphology and morphometrics, seasonal fluctuation, per cent parasitism and varietal reactions are summarised here.

A survey was conducted in the rice fields of Ollukkara and Madakkathara panchayats of Thrissur district. Three locations were selected from each panchayat for the study. The platygasterid parasitoids were collected by net sweeping and also by *in situ* rearing. The morphological characters of the platygasterids were studied and the species were identified after running the key to the species of *Platygaster*.

Six species of *Platygaster* viz. *P. coorgensis* (Mukerjee), *P. inderdaadi* (Mukerjee), *P. malabaricus* (Mukerjee), *P. minimus* (Mukerjee), *P. oryzae* Cameron and *P. sasii* Ushakumari were obtained from the net sweeping. Out of this six species, *P. coorgensis, P. minimus, P. orzyae* and *P. sasii* were obtained from rearing the galls.

Two types of *Platygaster* were observed based on the number of parasitoids emerged from the galls, the solitary and gregarious type. The solitary type is *P. sasii* and the gregarious types are *P. coorgensis, P. minimus* and *P. oryzae*. All the species of *Platygaster* except *P. oryzae* are new reports from the galls of *Orseolia oryzae*.

No platygasterids were obtained from vegetable galls and also from mealy bugs and whiteflies occurring in vegetables. This may be due to the regular pest management practices adopted in vegetable crops.

The morphology and morphometrics study established the correct identity of the species. The salient features of the species studied are summarised as follows:

P. coorgensis: Body length 1.13 mm; antenna 10 segmented with five club forming segments, club forming segments dark coloured; notauli absent; scutellum slightly convex; submarginal vein present.

P. inderdaadi: Body length 1.21 mm; antennal segment 10 with five club forming segments, fourth segment large sized, all segments brown; notauli absent; scutellum convex; submarginal vein present.

P. malabaricus: Body length 1.3 mm; antennal segment 10 with five club forming segments, except scape all other segments are black, scape brown; scutellum convex; notauli absent; submarginal vein present.

P. minimus: Body length 1.39 mm; antennal segments 10 with five club forming segments, club forming segments black; notauli faint; submarginal vein present.

P. oryzae: Body length 1.1 mm; antennal segments 10 with four club forming segments; club forming segments dark; notauli faint; submarginal vein absent.

P. sasii: Body length 2 mm; antenna 10 segmented with five club forming segments, thread like in male, first three segments brown, others black; notauli distinct; submarginal vein present.

The platygasterid count was taken from the net sweeping at weekly intervals from each location in both 'virippu' and 'mundakan' seasons. The locational differences in the populations were not significant. Considering the two seasons, the populations were significantly higher during the 'mundakan' season. Gall infestation was also found to be higher during this season. There was significantly higher population of platygasterid parasitoids in the variety Jyothi than Chitteni.

The per cent parasitism was worked out from the *in situ* collection of galls. The per cent parasitism in the two panchayats showed no significant difference. The per cent parasitism was significantly higher during the 'mundakan' season, which is during the last week of October. This prints out the clear seasonal influence in the activity of platygasterid parasitoids. It is observed that the per cent parasitism shows no significant difference between the varieties.

Seven species of other hymenopteran parasitoids were also recorded from the galls at the time of rearing. They are *Eurytoma* sp. (Eurytomidae), *Litus* sp.

(Pteromalidae), *N. cinctiventris* Girault (Eupelmidae), *Telenomus* sp. (Scelionidae), one species of Eucoilidae and two species of Mymaridae. All these seven species are new reports from Kerala.

The influence of rice varieties on the platygasterid activity was studied in the germplasm collections maintained at the RARS, Pattambi. A total of 229 varieties were observed in the two seasons. Gall infestation and platygasterid parasitoids were absent in all varieties in 'mundakan' 2002. In 'virippu' 2003, gall infestation was observed in the varieties Red Ponmani, Co-42, IET-13358, MTU-7 and Kuruva, but no *Platygaster* parasitoids were recorded. The low gall infestation may be due to the strong prophylactic measures adopted to protect the valuable germplasm accessions.

References

REFERENCES

Ambikadevi, D. 1998. Natural enemies of rice plants in Kuttanad, Kerala. *Insect environment* 4: 81-82

Amendt, J. 1997. Species richness and species composition of parasitoid complexes of selected gall midges (Diptera: Cecidomyiidae) on *Salix* sp. (Salicaceae). *Proceedings of the society for general and Applied Entomology*, March 18-22, 1997, Bayreuth, Germany 11: 1-6, 513-516

*Ayyar, T.V.R. 1963. *Handbook of Economic Entomology for South India.* Madras p.247

Beevi, S.P., Lyla, K.R. and Narendran, T.C. 2000. Hymenopteran diversity in single and double cropped rice ecosystem in Kerala, India. *Int. Rice Res. Notes* 25: 20-21

Bhardwaj, D., Kaushik, U.K., Pawar, A.D. and Agrawal, R.K. 1988. Relationship between rice gall midge and its parasitoids under field conditions. *Oryza* 25: 97-98

Carver, M. and Reid, I.A. 1996. *Aleyrodidae (Hemiptera: Sternorrhyncha) of Australia.* Technical Paper No.37, 1-55; CSIRO-Australia Division of Entomology pp.6

Chand, P. 1981. Rice gall midge in the summer crop at Ranchi. *Int. Rice Res. Newsletter* 6: 19

Chandrakar, H.K., Pophaly, D.J., Gupta, R. and Kaushik, U.K. 1989. Naturally occurring biological control of rice gall midge at Raipur, India. *Oryza* 26: 393-395

Chiu, S.F. 1980. Present and future gall midge control strategies in South China. *Int. Rice Res. Newsletter* 5: 20-21

Curtis, J. 1837. *A guide to an arrangement of British Insects.* Second edition, greatly enlarged London p.294

Das, P.K., Mathur, K.C. and Natarajan, K. 1987. Natural enemies of rice and grass gall midges. *Indian J. agric. Sci.* 57: 915-919

Dey, D.M., Raghuraman, S.L., Gupta and Ramamurthy, V.V. 1999. A check list of the biodiversity of hymenopterous parasitoids associated with rice agro ecosystem. *'Shashpa' (A Journal of Entomological Research).* Special issue No.1, September 1999 pp.48

Foerster, A. 1856. Proctotrupoidea; Hymenoptera. *Hym. Stud.* 2: 106-116

Gerling, D. 1990. Natural enemies of white flies: predators and parasitoids. *Whiteflies; their bionomics, pest status and management. Key to the genera Amitus.* pp.147-177

Greathead, D.J. 1986. Parasitoids in classical biological control. *Insect Parasitoids* (eds. Waage and Greathead). Academic Press, London, pp.289-318

Grover, P. and Prasad, S.N. 1980. Binomics of silver shoot gall fly *Orseolia oryzae* (Wood-Mason), a pest of rice in India. *Cecidologia Int.* 1: 23-92

Haliday, A.H. 1833. An essay on the classification of the parasitic Hymenoptera of Britain, which correspond with the *Ichnemons minuti* of Linnaeus. *Ent. Mag.* 1: 259-276

Hidaka, T., Klai, V., Chandraprabha, N. and Chantrasart, S. 1978. Serious incidence of the rice gall midge in the central plain of Thailand. *Appl. Ent. Zool.* 13: 260-263

Hummelen, P.J. and Soenarjo, E. 1977. Notes on the biology of *P. oryzae, Obtusiclava oryzae* and *Neanastatus oryzae*, parasites of the rice gall midge, *Orseolia oryzae. Contributions Central Research Institute for Agriculture,* Bogor, Indonesia. No.31. pp.18

ICAR. 1994. *Biological suppression of rice pests.* Fifteen years of AICRP on biological control. pp.57

Jena, B.C., Patnaik, N.C. and Panda, N. 1985. Gall midge activity and parasitization by *Platygaster oryzae* in Jaya stubble and wild rice at Bhubaneswar, India. *Int. Rice Res. Newsletter* 10: 20

Joshi, R.C., Venugopal, M.S. and Hidaka, T. 1984a. Some observations on *Platygaster* (Platygasteridae: Hymenoptera) from India - a parasite of rice gall midge, *O. oryzae* (Wood-Mason) (Cecidomyiidae: Diptera) *Cecidologia - Internationale* 5: 65.

Joshi, R.C., Venugopal, M.S. and Hidaka, T. 1984b. Occurrence of gall midge in ratoon rice. *Cecidologica Internationale* 5: 67-68

Kadkao, S. 1991. Seasonal occurrence of the rice gall midge, *Orseolia oryzae* (Wood-Mason), in a wild rice field in Thailand and parasitism by its parasitoids, *Platygaster oryzae* Cameron and *P. foersteri* (Gahan) (Platygasteridae: Hymenoptera). *Japanese J. Ent.* 59: 449-465

Kajita, H. 2000. Geographical distribution and species composition of parasitoids (Chalcidoidea: Hymenoptera) of *Trialeurodes vaporariorum* and *Bemisia tabaci* complex (Homoptera: Aleyrodidae) in Japan. 35: 155-162

Katti, G., Pasalu, I.C. and Krishnaiah, K. 2000. Quantifying the role of natural biological control in rice - a case study in a farmer's field. *J. biological control* 14: 15-21

*Kirchner. 1867. (cited by Vlug, H.J. 1995). *Catalogue of the Platygasteridae (Platygastroidea) of the world (Insecta: Hymenoptera).* SPB Academic Publishing by Amsterdam-Netherlands pp.168

Kobayashi, M. and Kadkao, S. 1978. Host species of hymenopterous parasites to rice gall midge observed in Thailand. *Japan agric. Q.* 12: 115-116

Kobayashi, M. and Kadkao, S. 1984. Biological characteristics of *P. oryzae* Cameron and *P. foersteri* (Gahan) (Platygastridae: Hymenoptera) parasitoids of rice gall midge *Orseolia oryzae* (Wood-Mason) in Thailand. *Kontyu* 52: 128-136

Kobayashi, M. and Kadkao, S. 1989. Seasonal occurrence of the rice gall midge, *Orseolia oryzae* (Wood-Mason) and parasitism by its parasitoids, *Platygaster oryzae* Cameron and *P. foersteri* (Gahan) (Platygasteridae: Hymenoptera) in paddy fields in Thailand. *Japanese J. Ent.* 57: 901-915

Kobayashi, M. and Kudagamage, C. 1994. Hymenopterous parasitoids of the rice gall midge, *Orseolia oryzae* (Wood-Mason) in the Maha season in Sri Lanka. *Japan agric. Res. Q.* 28: 112-116

Kobayashi, M., Kudagamage, C. and Nugaligadde, L. 1991. Hymenopterous parasitoids of the rice gall midge, *Orseolia oryzae* (Wood-Mason) in the early Maha season in Sri Lanka. *Japan agric. Res. Q.* 25: 65-68

Kobayashi, M., Nugaliyadde, L., Chandrasiri - Kudagamage and Kudagamage, C. 1990. Natural enemies of the rice gall midge, *Orseolia oryzae* (Wood-Mason) observed in Yala Season in Sri Lanka. *Japan agric. Res. Q.* 23: 323-328

Koponen, M. and Huggert, L. 1982. Platygasteridae (Hymenoptera: Proctotrupoidea) from Finland. *Not. Entomol.* 62: 51-59

Liu, S.K., Huang, D.P., Chiu, S.F. and Gu, S.W. 1981. The parasites of the rice gall midge *Orseolia oryzae* (Wood-Mason) in Kwangtung Province and their susceptibilities to insecticide applications. *Acta Ent. Sin.* 24: 274-282

Mani, M.S. 1975. On a collection of Scelionidae and Platygastridae (Hymenoptera: Proctotrupoidea) from India. *Mem. Sch. Ent.* 4: 63-80

Marshall, M.A. 1873. A catalogue of British Hymenoptera. *Oxyura. Publ. Ent. Soc. London* pp.27

Masner, L. 1993. Superfamily Platygastroidea. *Hymenoptera of the world* (eds. Goulet and Huber). pp. 558-565

Masner, L. and Huggert, L. 1989. World review and keys to genera of the subfamily Inostemmatinae with reassignment of the taxa to the Platygastrinae and Sceliotrachelinae (Platygastridae: Hymenoptera). *Mem. Ent. Soc. Can.* (147): 214

Mathur, K.C., Das, P.K. and Sasmal, S. 1988. Host range of solitary *Platygaster* species, a parasitoid of rice gall midge (*Orseolia oryzae*). *Indian J. agric. Sci.* 58: 871-873

Mathur, K.C., Das, P.K. and Sasmal, S. 1989. *Eurytoma* species: New facultative hyperparasitoids in *P. oryzae*. 59: 184-185

Mo, Y.S., Chen, Y.L. and Hu, Z.S. 1985. Study on *P. oryzae* Cameron (Platygasteridae: Hymenoptera) a parasitoid of the rice gall midge. *Natural enemies of insects* 7: 159-162

Muesebeck, C.F.W. 1979. Proctotrupoidea: 1121-1170 in *Catalog of Hymenoptera in America North of Mexico* (eds. K.V.Krombein, P.D. Hurd, Jr.D.R.Smith and B.D.Burks) 1: 1198 p

Mukerjee, M.K. 1978. Descriptions of some new records of known Platygasteridae (Proctotrupoidea: Hymenoptera) from India. *Mem. Sch. Ent.* 5: 67-98

Mukerjee, M.K. 1981. On a collection of Scelionidae and Platygasteridae (Proctotrupoidea: Hymenoptera) from India. *India Rec. Zool. Survey. India, Misc. Publ.* 27: 1-78

Muthuswami, M. and Gunathilagaraj, K. 1989. Effect of rice gall midge (GM) resistance on parasitic behaviour of *P. oryzae* Cameron. *Int. Rice Res. Newsletter* 14: 19

Nacro, S., Dakouo, D. and Heinrichs, K.A. 1995. Population dynamics, host plant damage and parasitism associated with the African rice gall midge in Southern Burkina Faso. *Insect Science and its application* 16: 251-257

Narendran, T.C. 2001. *Parasitic Hymenoptera and biological control.* Palani Paramount Publications, India, p.190

Nwilene, F.E., Jones, M.P. and Okhidievbie, O. 2000. Influence of rice varieties on parasitism of the African rice gall midge (AfRGM). *Int. Rice Res. Notes* 25: 22-23

Panse, V.G. and Sukhatme, P.V. 1985. *Statistical Method for Agricultural Workers*. Fourth Edition. Indian Council of Agricultural Research, New Delhi, p.353

Patnaik, N.C. and Stapathy, J.M. 1984. Facultative hyperparasitism/predatism on *P. oryzae* Cameron, an egg-larval parasite of the rice gall midge *O. oryzae* (Wood-Mason) . *J. Ent. Res.* 8: 106-108

Potineni, K. and Agarwal, P.K. 1984. Parasitization of gall midge by *Neanastatus grallarius* (Masi). *Int. Rice Res. Newsletter* 9: 27

Rai, P.S., Gowda, G. and Naidu, B.S. 1976. Incidence of rice gall midge and its parasites in Karnataka, India. *Int. Rice Res. Newsletter* 2: 17

Ramaiah, E. 1970. Effect of natural parasitisation on the population of paddy gall fly *Pachydiplosis oryzae* Mani. *Allahabad Farmer* 42: 263-267

Rao, N.V., Rao, B.H.K.M., Rao, V.L.V.P and Reddy, P.S. 1981. A note on the population fluctuation of rice gall midge and yellow stem borer in Warangal region of A.P., India. *Madras agric. J.* 68: 266-269

Rao, C.S., Rao, N.V. and Razvi, S.A. 1983. Parasitism, a key factor in checking rice pest populations. *Entomon* 8: 97-100

Sain, M. and Kalode, M.B. 1992. Seasonal dynamics of gall midge, *Orseolia oryzae* (Wood-Mason) and its parasites in rice at Rajendranagar, Hyderabad, India. *Indian J. Pl. Protection* 20: 223-225

*Schrank, F.de.P. 1781. Enumeratio Insectorum Austriae Indigenorum. *Austae Vindelicorum*: Klett et Franck. p.548

Shrivastava, S.K., Shukla, B.C., Gupta, R. and Kittur, S.U. 1987. Seasonal incidence of rice gall midge and its natural enemies in Madhya Pradesh. *Oryza* 24: 87-90

Shukla, B.C., Kaushik, U.K., Shrivastava, S.K., Pophaly, D.J. and Agrawal, R.K. 1983. A new gall midge parasite in M.P., India. *Int. Rice Res. Newsletter* 8: 17

*Torre, D.C.G.D. 1898. Catalogus Hymenopterorum hucusque descriptorum systematicus et synonymicus v. Chalcididae et. Proctotrupidae. *Leipzig*. p.598

Ukwungwu, M.N. and Joshi, R.C. 1992. Distribution of the african rice gall midge, *Orseolia oryzivora* (Harris and Gagne) and its parasitoids in Nigeria. *Tropical pest management* 38: 241-244

Umeh, E.D.N. and Joshi, R.C. 1992. Aspects of the biology, ecology and natural biocontrol of the African rice gall midge *Orseolia oryzivora* (Harris & Gagne) (Cecidomyiidae: Diptera) in south east Nigeria. *J. appl. Ent.* 116: 391-398

Ushakumari, R. 2002. Investigation on the alpha systematics of Platygastroidea (Hymenoptera) of Kerala State. Ph.D. thesis, Calicut University, Calicut p.131

Viggiani, G. 1997. Discovery of the male of *Amitus fuscipennis* (Mac Gown and Nebeker) (Platygasteridae: Hymenoptera), a parasitoid of *Trialeurodes vaporariorum* (West Wood) (Aleyrodidae: Homoptera). *Bolletino-del-Laboratorio-di-Entomologia-Agraria-"Filippo-Silvestri"* 52: 97-99

*Vlug, H.J. 1995. *Catalogue of the Platygasteridae (Platygastroidea) of the world (Insecta: Hymenoptera)*. SPB Academic Publishing by Amsterdam-Netherlands. 168pp

*Yamagishi, K. 1980. Platygasterid parasites of willow gall midges in Japan (Proctotrupoidea: Hymenoptera). *Esakia* 15: 161-175

* Originals not seen

PLATYGASTERID PARASITOIDS IN RICE AND VEGETABLES

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ABSTRACT OF THE THESIS

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ABSTRACT

The survey was conducted in the rice fields of Ollukkara and Madakkathara panchayats of the Thrissur district, Kerala during June 2002 to January 2003. Six species of *Platygaster* namely, *P. coorgensis* (Mukerjee), *P. inderdaadi* (Mukerjee), *P. malabaricus* (Mukerjee), *P. minimus* (Mukerjee), *P. orzyae* Cameron and *P. sasii* Ushakumari have been recorded as pupal parasitoids of the rice gall midge *Orseolia oryzae* (Wood-Mason). All the species except *P. oryzae* are new reports from rice gall midge *O. oryzae* (Wood-Mason). Parasitism by platygasterid parasitoids in cecidomyiid galls, mealy bugs and white flies of vegetables was recorded during the survey.

The species composition as well as seasonal and varietal variation in the incidence of the parasotoids and the other relevant aspects of the study have bee discussed.

P. coorgensis is 1.13 mm in length; antenna 10 segmented with five club forming segments; notauli absent; submarginal vein present. *P. inderdaadi* is 1.21 mm in length; antenna 10 segmented with five club forming segments, fourth segment large sized; notauli absent; submarginal vein present.

P. malabaricus and *P. minimus* differ in case of notauli character. In *P. minimus* notauli is present where as in *P. malabaricus* it is absent. *P. oryzae* is the smallest among the six species studied i.e., 1.1 mm in length; antennal segments 10 with four club forming segments; notauli present and is faint, submarginal vein absent.

P. sasii is the largest among the six species, 2 mm in length. It is the solitary species while all others are gregarious, antenna 10 segmented with five club forming segments, notauli distinct and submarginal vein present.

The peak *Platygaster* population was recorded in the 'virippu' season and during the first week of September. In the 'mundakan' season, the maximum population was observed during the second week of November. There is significant

difference in *Platygaster* populations between the two seasons, the 'mundakan' season, showing significantly higher population of *Platygaster* parasitoids than in the 'virippu' season.

The maximum per cent parasitism was observed during the third week of September in 'virippu' season (25.69) and last week of October in 'mundakan' season (44.17) in both panchayats. The mean per cent parasitism in 'virippu' season was 20.67 and in 'mundakan' season it was 33.94. The per cent parasitism was found to be significantly higher in 'mundakan' season.

Two types of *Platygaster* were observed based on the number of parasitoids emerging from the galls, namely, the solitary and gregarious types. The solitary type is identified as *P. sasii* and the gregarious types are identified as *P. coorgensis*, *P. minimus* and *P. oryzae*.

Seven species of other hymenopteran parasitoids also recorded from the galls. They are *Eurytoma* sp. (Eurytomidae), *Litus* sp. (Pteromalidae), *Neanastatus cinctiventris* Girault (Eupelmidae), *Telenomus* sp. (Scelionidae), one species of Eucoilidae and two species of Mymaridae.

There was no gall fly infestation and platygasterid parasitoids in the rice varieties studied during 'mundakan' 2002 season at RARS, Pattambi. During 'virippu' 2003, out of the 50 varieties observed, gall infestation was seen in the varieties Red Ponmani, CO-42, IET-13358, MTU-7 and Kuruva, but no *Platygaster* parasitoids were recorded from these varieties.